POLLUTION POTENTIAL OF PEAT COMBUSTION, LIQUEFACTION AND GASIFICATION

Submitted To

Environment Canada

November 1983

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17 November 1983

DSS 7987-3

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45 Alderney Drive
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Dear Ms. Day:

Re: Pollution Potential of Peat Processes
(DSS File No. 10SC.KE202-2-P076)

We are pleased to submit this final report which takes into account your reviews of the first and second drafts.

We trust that the information we have provided will assist you in your further work related to the use of peat as an energy source.

Yours very truly,

Keith D. Phinney

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Project Manager

ABSTRACT

The report considers the pollution potential associated with processes for the combustion and conversion of peat into liquid and gaseous fuels. Very limited information is available in the literature concerning the pollution potential of these processes.

The use of and technology for combustion of peat is highly developed. This has allowed for a quantitative assessment of the pollution potential of peat combustion processes. This assessment has shown that current and developing pollution control practices for coal and oil fuelled plants in Canada and elsewhere should be directly applicable to peat fuelled systems.

Technology for the conversion of peat into liquid and gaseous fuels is at an early stage of development. Consequently, very limited information is available concerning the pollution potential of these processes. The available information, and information for coal conversion processes has been used to provide a qualitative assessment of the pollution potential of peat conversion processes. Further studies will be required to quantitatively assess the potential for pollution following the availability of pilot plant data, and component and heat balances for industrial scale operations.

RÉSUMÉ

Le rapport étudie les problèmes de pollution associés aux procédés de combustion et de conversion de la tourbe en combustibles liquides et gazeux. Il y a très peu d'information dans la documentation quant à la pollution possible associée à ces procédés.

L'utilisation et la technologie de la combustion de la tourbe sont très développées. Ceci a permis de faire une évaluation quantitative du potentiel de pollution associé aux procédés de combustion de la tourbe. Cette évaluation a démontré que les méthodes de contrôle de pollution actuelles et à l'étude, pour les centrales alimentées au mazout et au charbon, au Canada et à l'étranger, devraient pouvoir s'appliquer directement aux systèmes alimentées à la tourbe.

La technologie pour la conversion de la tourbe en combustibles gazeux et liquides en est à un stade de développement assez préliminaire. Conséquemment, une information très limitée concernant le potential de pollution de ces procédés est actuellement disponible. L'information disponible et l'information relative aux procédés de conversion du charbon ont été utilisées pour fournir une évaluation qualitative des problèmes éventuels associés aux procédés de conversion de la tourbe. Des études plus approfondies seront nécessaires pour évaluer quantitativement la pollution éventuelle, à mesure que les données provenant d'une usine-pilote deviendront disponibles de même que les bilans des composée et thermiques d'opérations à échelle industrielle.

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GENERAL INTRODUCTION

This report considers the pollution potential of peat combustion, liquefaction and gasification processes in accordance with the terms of reference for the study, dated 1 December 1982 (DSS File Number 10SC.KE 202-2-P076). The objectives of the study were:

1. To review and describe existing and developing large scale technologies for the combustion and conversion of peat into liquid and gaseous fuels.

2. To provide, where feasible, quantitative information concerning material and heat balances for peat and other similar fuels so as to define the quantities and properties of wastes produced from the processing of peat, relative to the use of other fossil fuels and biomass.

3. To review and assess pollution control technology for application to wastes from the combustion, liquefaction and gasification of peat.

4. To provide recommendations for any further studies as regards the waste management aspects associated with the combustion, liquefaction and gasification of peat.

Only very limited information was found in the general literature concerning the pollution potential of peat. Numerous references were detected concerning the combustion and conversion of peat to liquid and gaseous fuels. The list of references is given in a separate report submitted to EPS, titled, "General Bibliography Re: Combustion, Gasification and Liquefaction of Peat".

Part One of the report, which considers the combustion of peat, is based on quantitative material balances and well known overall

thermodynamic efficiencies for combustion of peat in industrial scale furnaces. This is not the case for Part Two which considers the liquefaction and gasification of peat. There are no known industrial operations which produce liquid and gaseous fuels from peat. In fact, technology for the conversion of peat can be considered to be at an early stage of development and hence there is a lack of information that would allow for a "quantitative" assessment of the pollution potential of peat liquefaction and gasification. Hence, Part Two provides a qualitative assessment of the pollution potential, based primarily on information available from studies into liquefaction and gasification of coal. The Ontario Research Foundation, as subcontractor to Monenco Limited, provided information concerning liquefaction and gasification.

CONCLUSIONS

PEAT COMBUSTION

1. The sources of wastes for peat fuelled power plants are similar if not identical to those for the use of other fuels such as wood, coal and oil.

2. At equivalent power generation capacity, the combustion of peat generates a greater volume of flue gas than for the combustion of coal and oil.

3. In general, emissions of sulfur oxides for a peat fuelled power plant would be expected to be less than for coal and oil fuelled plants, of equivalent power generation capacity. The emissions become similar in quantity as the sulfur content of coal approaches approximately 0.5 weight percent or less.

4. Monitoring of power plants in Finland indicates that emissions of nitrogen oxides from peat fuelled power plants are the same order of magnitude as for combustion of coal and oil.

5. Monitoring of power plants in Finland indicates no major differences between combustion of peat and coal as regards the emissions of polycyclic aromatic hydrocarbons (PAH). However, the results of smaller scale combustion tests and consideration of the relatively low peat combustion temperature suggests that further consideration of PAH may be warranted.

6. At equivalent power plant output, the combustion of peat and coal generates similar quantities of ash.

7. As for coal, the combustion of peat results in the emission of trace elements.

8. At equivalent power generation capacity, the operation of peat, coal, wood, or oil fired power plants would be expected to generate similar quantities and types of liquid wastes.

9. At equivalent power generation capacity, the rejected heat from a peat fuelled power plant would be of the same order as that for wood, coal and oil fuelled stations.

10. Current and developing pollution control practices applied to coal and oil fired thermal power plants in Canada and elsewhere should be directly applicable to peat fuelled systems.

PEAT LIQUEFACTION AND GASIFICATION

1. A review of the literature and current developments indicates that technology for the liquefaction and gasification of peat is at an early stage of development. Consequently, very limited quantitative data are available concerning the pollution potential of these processes.

2. A review of coal conversion processes indicates that liquefaction and gasification results in gaseous, liquid and solid wastes. The wastes can be expected to contain inorganic and hydrocarbon contaminants. In general, technology is available for removal of these contaminants at source.

3. Further studies will be required to assess the pollution potential of peat liquefaction and gasification processes following the availability of pilot plant data, and component and heat balances for proposed industrial operations.

PART 1

PART ONE

COMBUSTION OF PEAT

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1.1 INTRODUCTION

This section of the report provides a brief review of peat combustion technology and then considers wastes and waste management technology with respect to the use of peat as a fuel to generate electricity (steam cycle). The waste management aspects of related fuels, including wood, coal and oil, are also considered. This has enabled the less well known peat to be placed in perspective as regards its combustion characteristics and waste management considerations.

Only very limited information is available concerning waste management aspects associated with the combustion of peat. However, a three year study which has recently been completed by the Technical Research Centre of Finland will provide a very complete source of information concerning emissions associated with the operation of peat, coal and oil fired power plants, ranging in capacities from 30 MW to 1065 MW (Häsänen, 1982). The final report of this program should be available in the near future. Preliminary reports of the investigations (Häsänen and Pohjola, 1982; Häsänen, 1982) have been used as sources of information for this study.

In order to assess the waste management aspects associated with the combustion of peat and to provide a rationale for the preliminary results reported by the Finnish Study, extensive use of Monenco Limited inhouse design data and other information has been used to develop materials and heat balances for power plants with capacities of 1 MW to 100 MW.

1.2 COMBUSTION TECHNOLOGY

121 PEAT AS A COMBUSTION FUEL

The primary peat based combustion fuels are "sod" and "milled" peat. The fuel can also be obtained as briquettes and pellets. These latter fuels are used for relatively small combustion applications and are not considered further in this report.

TABLE 1-1

Peat Fuels

Fuel	Moisture Content	Bulk Volume (wet basis)	Net Heat Value (wet basis)	
	wt%	kg/m^3	MJ/kg	MJ/m^3
Sod Peat	35-45	300-400	10-13	3200-5100
Milled Peat	40-65	250-400	8-12	2200-4800
Briquettes	10-15	700-800	17-19	12000-15000
Pellets	10-30	650-750	14-19	9000-14000

TABLE 1-2

Typical Oxygen Content of Fuels

Fuel	Oxygen (dry, ash-free basis)
	wt%
Wood	45
Peat	35
Lignite coal	25
Subbituminous coal	15
Bituminous coal	5
Anthracite coal	3

Source: (Bodle et al, 1978)

TABLE 1-3

Biomass and Fossil Fuels - Nominal Fuel Characteristics

Fuel	Fixed Carbon (dry basis)	Volatiles (dry basis)	Ash (dry basis)	Sulphur (dry basis)	Heat Value (dry basis)
	wt%	wt%	wt%	wt%	MJ/kg
Wood	24	70-74	2-4	0.1	20
Peat	25-30	60-72	3-15	0.1-0.2	20
Lignite coal	45	40	15	1.1	21
Subbituminous coal	45-55	25-35	12-18	0.5	24
Bituminous coal	57	32	11	3-6	31
Anthracite coal	84	6	10	0.5-4.5	32
Fuel oil	83-86	-	0.3	0.5-6.3	43

Source: inhouse compilations of data for North American fuels

Sod peat consists of blocks of peat containing approximately 35 to 45 wt% moisture. Milled peat consists of relatively fine sized peat containing approximately 45 to 65 wt% moisture. The characteristics of these fuels as regards calorific value are given in Table 1-1.

As a source of energy upon combustion, peat can be ranked between biomass such as wood and "young" coals such as lignites. This is shown by the data for oxygen content of various fuels given in Table 1-2. The greater the oxygen content of a fuel, the less the energy which can be released upon combustion. This ranking of peat is reflected in the nominal characteristics of the various fuels given in Table 1-3.

122 CONVENTIONAL PEAT COMBUSTION TECHNOLOGY

This section of the report provides a brief review of the various technologies which are currently in use or undergoing development for the combustion of peat, principally to generate steam and electricity.

.1 Grate-Peat-Fired Furnaces

A large variety of grate type furnaces is available for the combustion of sod peat and similar bulky fuels such as wood. The majority of grate type furnaces range in capacity from approximately 1.5 MW to approximately 30 MW (fuel input), although capacities as large as 60 MW are available. Although peat is the primary fuel, natural gas or fuel oil is normally required to initiate combustion and, in some cases, to maintain stable combustion conditions, particularly during operation of the furnace at less than 50 percent capacity (fuel input).

The characteristics of sod peat as a fuel necessitates careful consideration in the specification and operation of grate type

furnaces. Inclined mechanical type grates are used to ensure an even distribution of the lumps of peat for combustion. The fuel entrance is often located directly above the grate as shown in Figure 1-1 for a small heating system. The relatively high volatiles content of peat requires a large furnace and a secondary air supply to ensure completeness of combustion. The non-uniformity in the size of lumps discharged into the furnace can result in an irregular distribution of peat on the grate leading to incomplete combustion with an accompanying loss of combustibles and high emissions of particulates.

Modern grate furnaces provide for automatic removal of ash from below the grate (bottom ash) and from the flue gas (fly ash). Sods of peat are often discharged into the furnace from directly above the grate to provide for removal of some of the moisture prior to combustion on the surface of the grate. Modern grate type furnaces can be equipped with microprocessors to allow for automatic control of combustion based on load demand and furnace operating parameters.

.2 Pulverized - Peat-Fired Furnaces

Pulverization of milled peat followed by combustion in suspension is the common practice for large steam generators rated from approximately 30 MW to 300 MW (fuel input). The technology is very similar to that for the burning of lignite coals. Although peat is the primary fuel for these furnaces, oil is normally required to initiate combustion, ensure a stable flame, and to maintain stable combustion conditions during operation of the furnace at a reduced load (fuel input). The use of oil may be equivalent to as much as 10 percent of the furnace capacity (fuel input). Due to the limited quantity of peat that can be stored onsite (fire hazard), it is not uncommon for the auxilliary fuel system to be capable of meeting the full furnace demand. This ensures no disruption in the event that peat is unavailable.

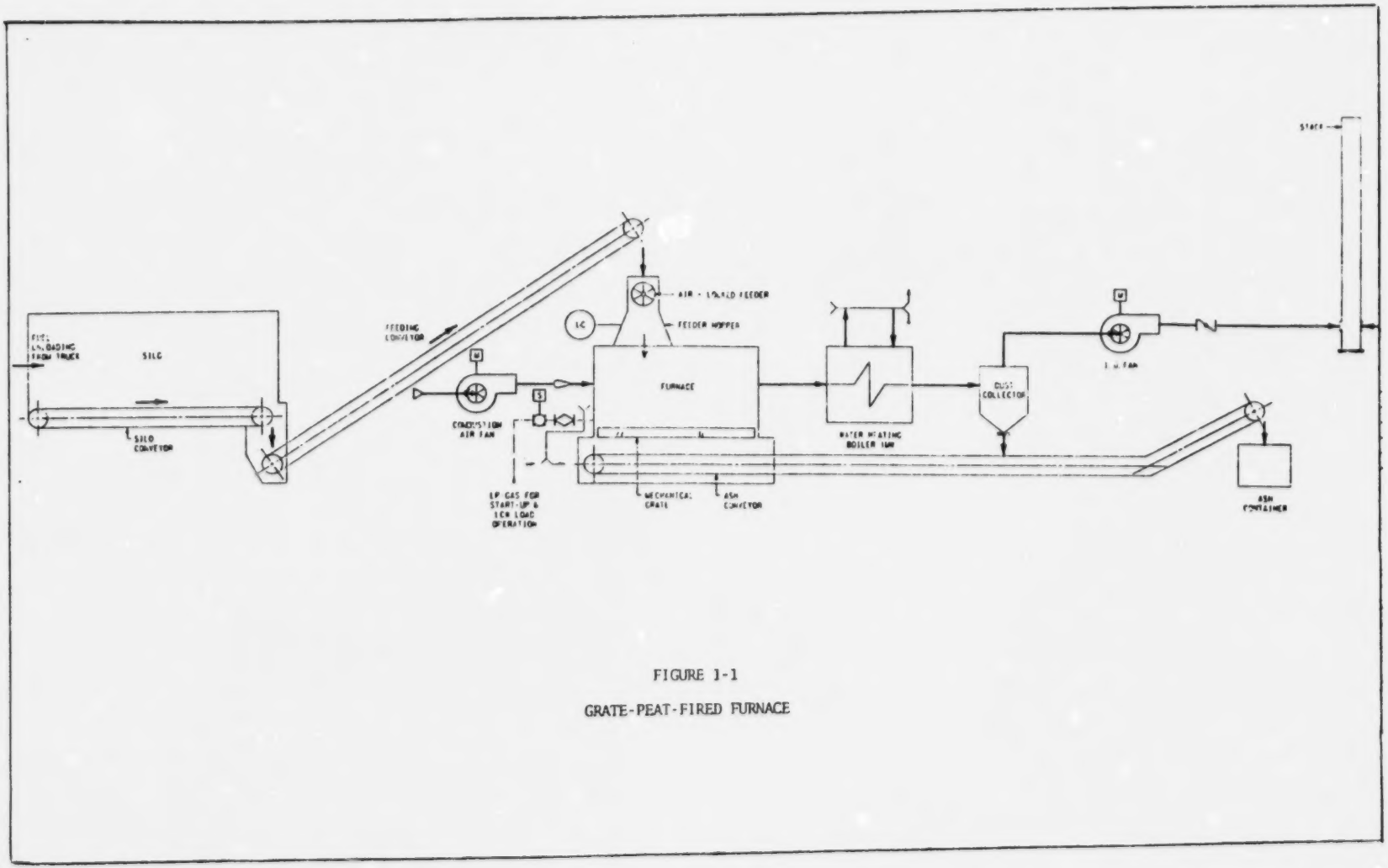


FIGURE 1-1

GRATE-PEAT-FIRED FURNACE

A typical layout of a boiler and auxilliaries is shown in Figure 1-2. Milled peat is discharged into a pulverizer (Figure 1-3) which reduces the size of the peat to allow for combustion in suspension. Furnace gases are recirculated into the pulverizer to carry the peat into an air classifier, for removal of oversized peat, and then into the combustion section of the furnace. Oversized material is returned to the pulverizer. Contact of the peat with the recirculated furnace gases during pulverization results in a reduction in moisture content of the peat prior to injection into the furnace. The pulverized peat is blown into the combustion section through sets of burners (Figure 1-4) located at the lower and upper sections of the furnace. Most of the peat is burned in the lower section of the furnace. Vapours evolved from the peat and finely pulverized peat particles rise to the upper section of the furnace.

Peat fuelled furnaces are considerably larger than the equivalent duty coal or oil fuelled furnaces. This is due to the bulk density of peat, its relatively low heat value, and the high volatiles content. For example, a 120 MW oil fired furnace would be approximately the same size as a 40 MW peat fuelled furnace.

Pulverized peat fired furnaces provide for automatic removal of bottom and fly ashes and are equipped with microprocessors to allow for automatic control of the furnace based on load demand and furnace operating parameters. Wet and dry handling systems can be used for the bottom and fly ashes, although modern furnaces tend to use dry handling methods.

123 ADVANCED AND DEVELOPING TECHNOLOGY

A number of unconventional systems for the combustion of peat

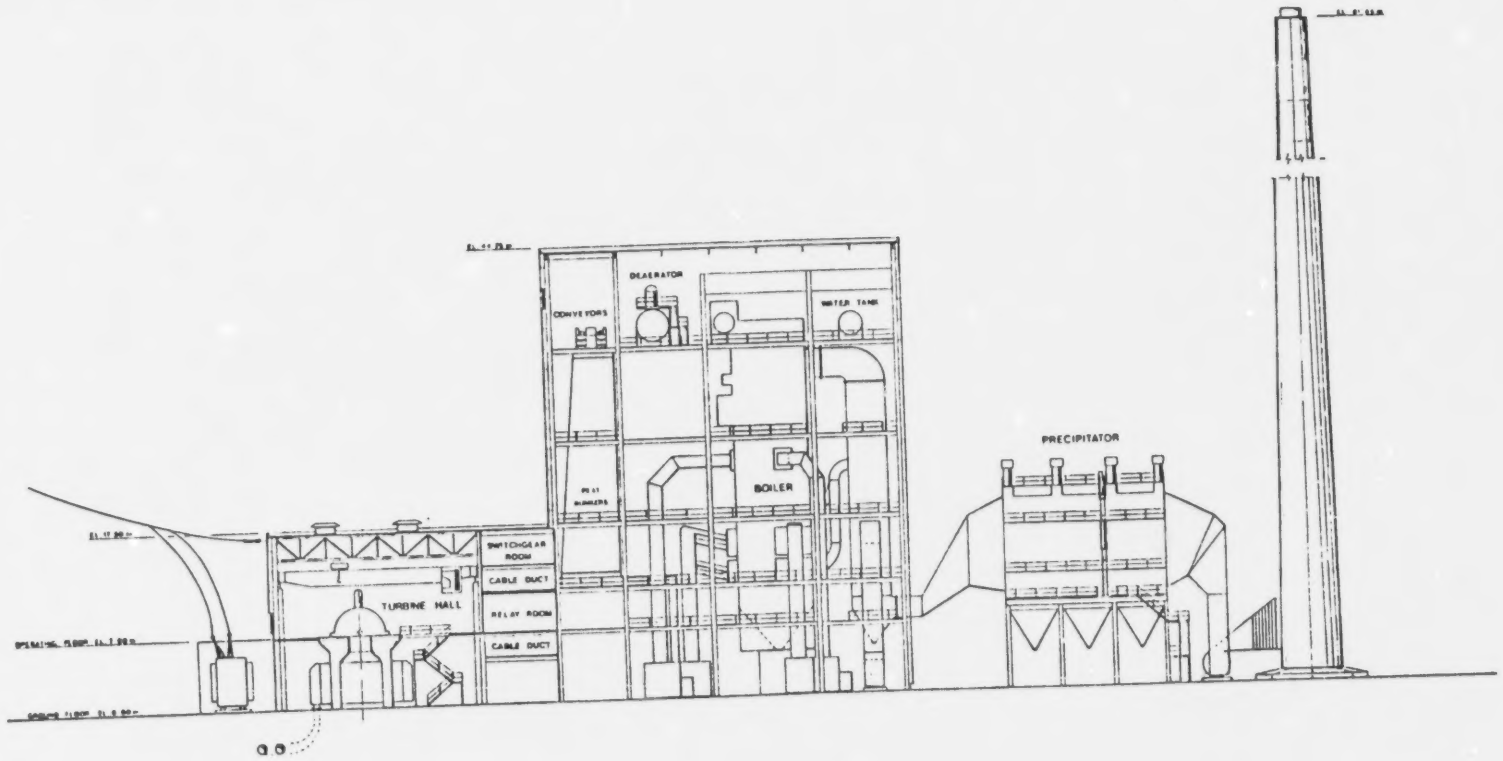


FIGURE 1-2

PULVERIZED PLAT FURNACE
(40 MW)

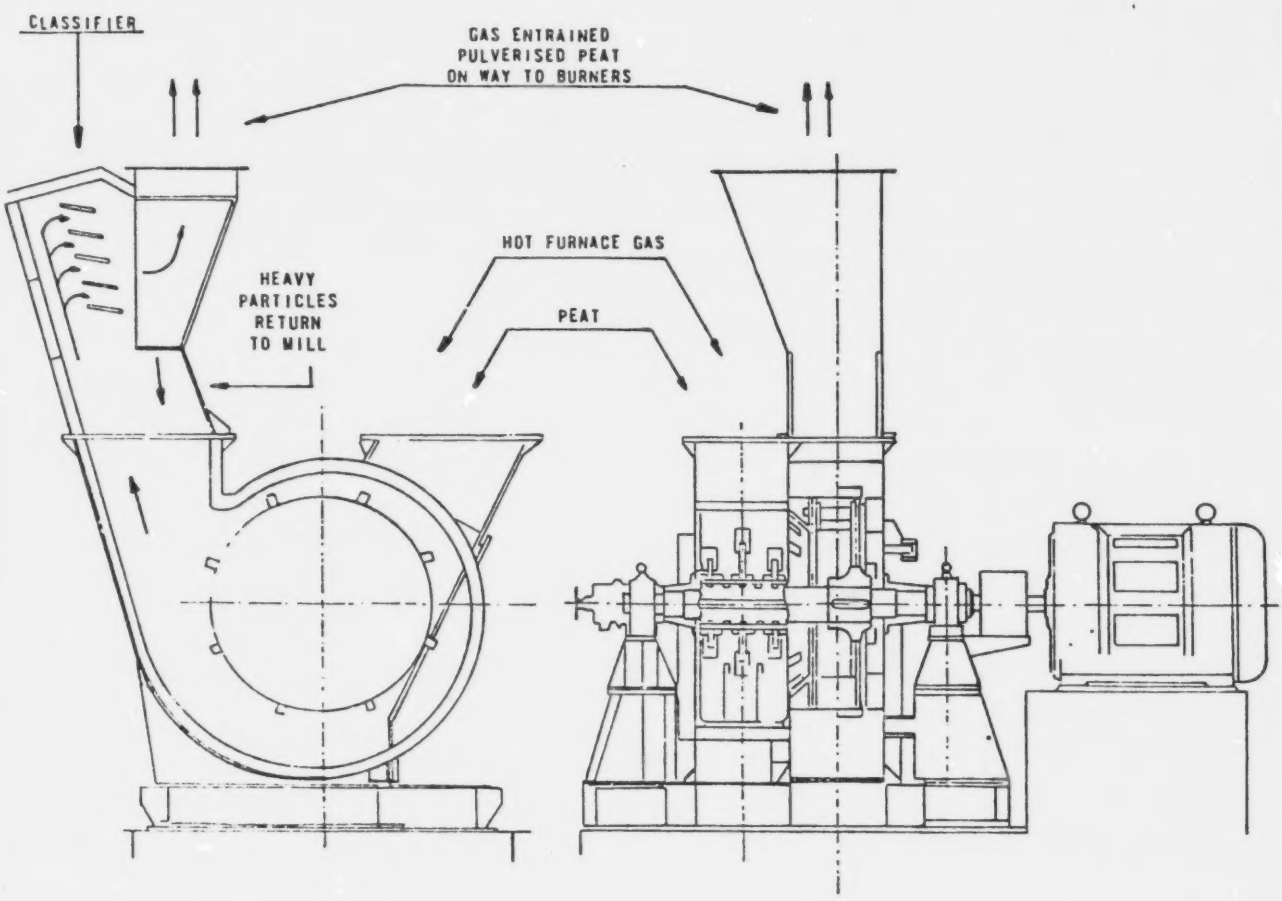


FIGURE 1-3

PEAT PULVERIZER

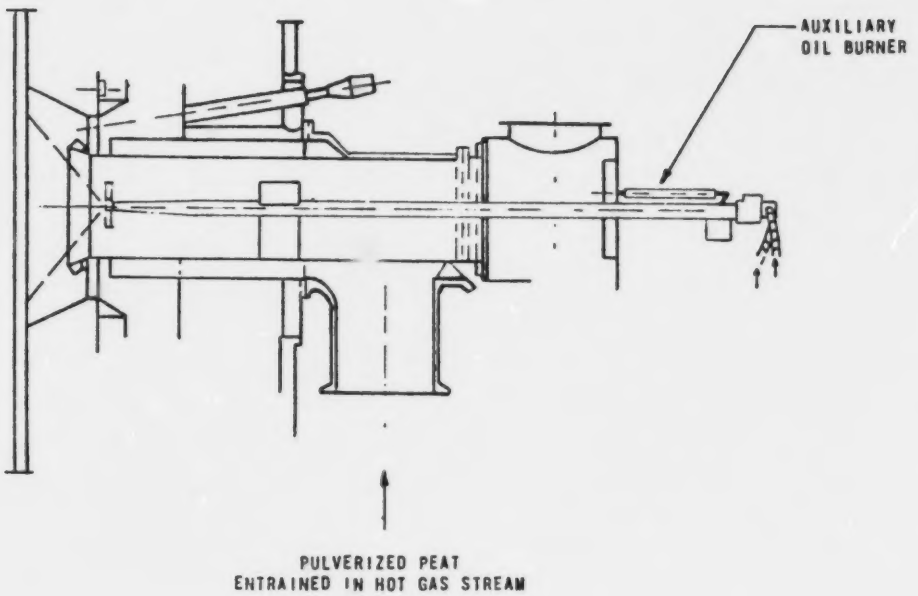


FIGURE 1-4

PULVERIZED PEAT BURNER

have been or are currently being developed. The capacities of these systems range from pilot plant scale to industrial boilers (approximately 30 MW and less). In general, these systems have been considered in order to improve the ease and efficiency of burning wet, bulky peat. In this regard much emphasis has been placed on combustion techniques which can manage the wide variation in peat moisture content. These and other unconventional peat combustion systems are briefly reviewed below.

.1 Combustion with Flue Gas Dried Peat

Flue gas can be used to dry peat prior to its injection into the furnace, with or without pulverization. Predrying reduces the quantity of flue gas and increases the efficiency of fuel use due to the higher combustion temperatures that can be obtained with drier peat. The reduction in moisture content, prior to combustion, can enable furnaces to be used which are similar in size to those for burning an equivalent amount of coal. Sufficient predrying (less than 30 wt% moisture) enables peat to be pulverized in conventional verticle spindle pulverizers, normally associated with coal and lignite fired furnaces.

Figure 1-5 shows a Finnish system for the drying of milled peat with flue gas prior to its combustion without pulverization.

.2 Cyclone Furnaces

Horizontal cyclone furnaces, which are refractory lined and operated at relatively high temperatures, can burn wet peat at high boiler efficiency (85 to 95%) with low excess air requirements. Milled peat and combustion air are blown tangentially into a horizontal cylinder which may be lined on the inside with refactory or fire-brick (Figure 1-6). The firing causes a swirling flame which whirls towards the exit scavenging the lining as it proceeds. In dry ash cyclone furnaces, slag which accumulates on the furnace lining is removed by periodically raising

FIGURE 1-5

COMBUSTION OF FLUE GAS DRIED PEAT

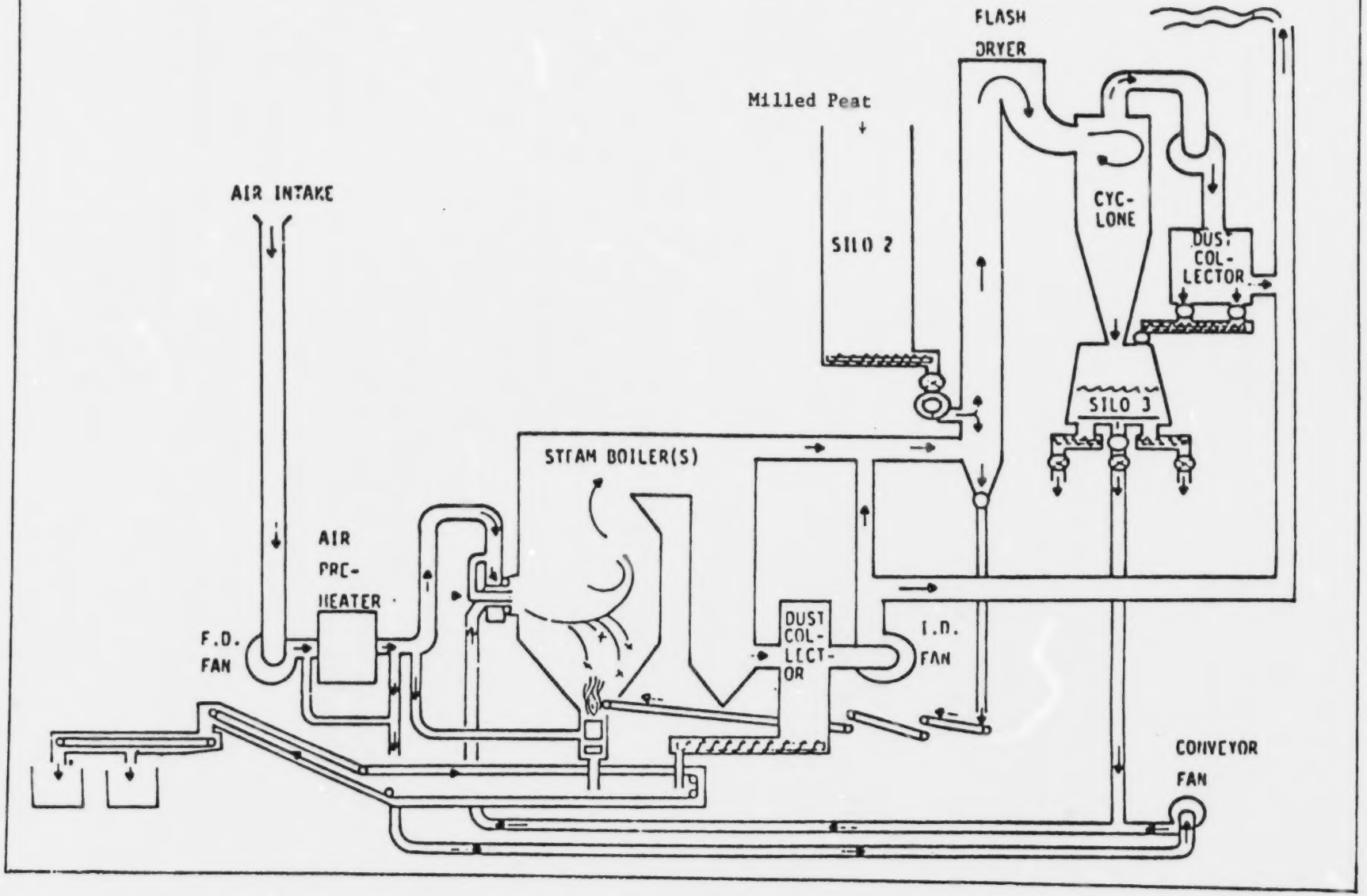
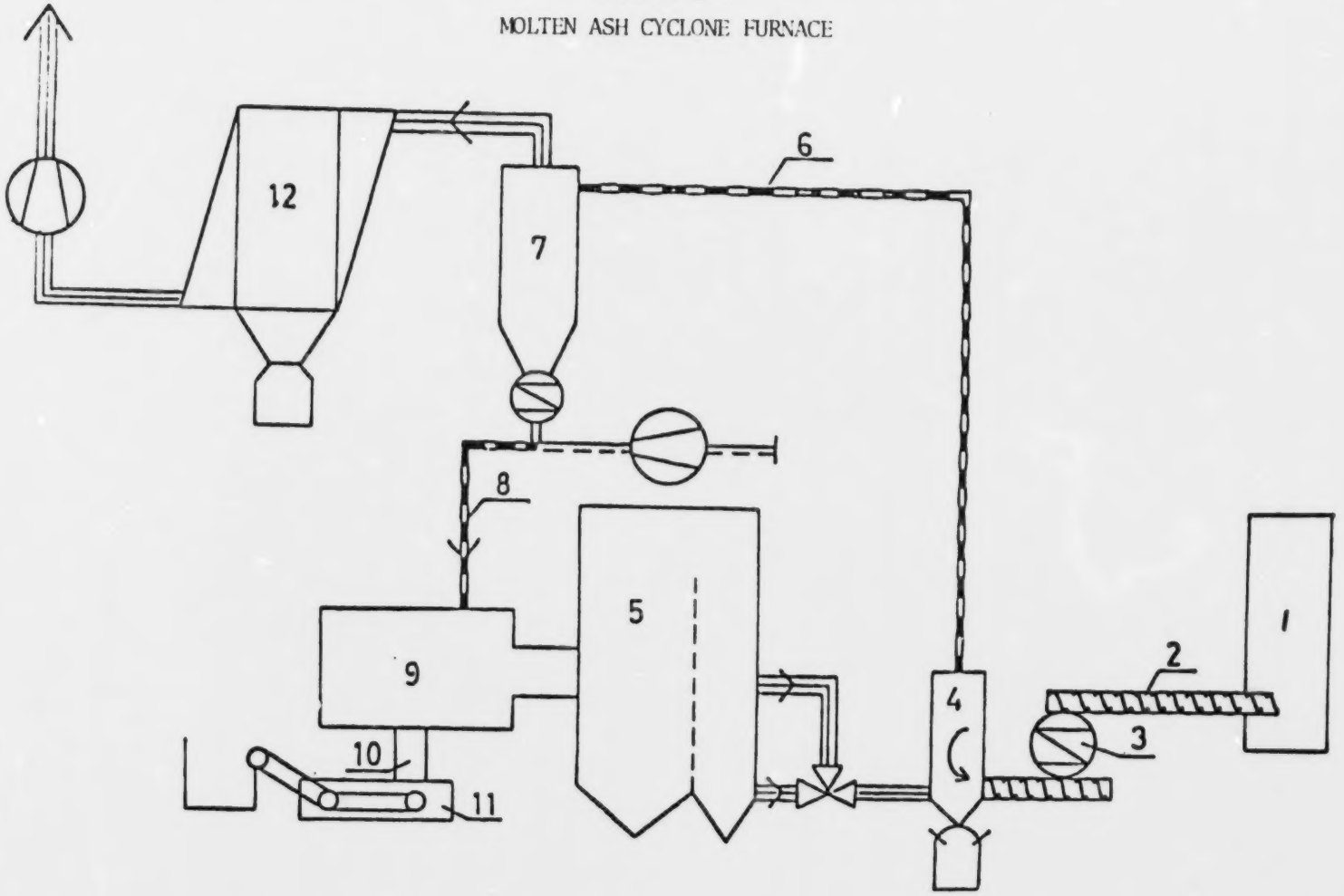


FIGURE 1-6

MOLTEN ASH CYCLONE FURNACE



Legend:

1	Silo	5	Boiler	9	Cyclone
2	Screw Feeder	6	Drying Channel	10	Slag Channel
3	Rotating Valve	7	Peat Separator	11	Quench Basin
4	Wind Sieve	8	Ejector	12	Flue Gas Scrubber

the furnace temperature beyond the slag melting point and allowing the molten ash to run out. In molten ash cyclone furnaces, a high temperature is maintained in the cyclone such that molten ash runs continuously into a water filled quench basin for automatic slag removal.

.3 Fluidized Bed Furnaces

Peat fuelled fluidized bed combustion systems are in limited operation in Europe (Finland) and are in a state of continuing development. Fluidized systems are claimed to operate at high fuel efficiencies despite variations in peat particle size and moisture content. High efficiencies are attributed to the intimate solid/gas contact provided under fluidized conditions. In addition, fluidized bed systems can minimize if not eliminate the requirement for auxilliary (support) fuels. Both sod and milled peat can be burned in fluidized systems, with or without pulverization.

As shown in Figure 1-7, peat enters the furnace where heavier particles burn near the bottom of the bed (grate type combustion) while smaller particles are burned as they rise towards the top of the furnace (suspension type combustion). The bed consists of quartz particles. Carbonate containing beds are not required for removal of sulfur oxides due to the relatively low sulfur content of peat. Bottom ash is periodically removed from the bottom section of the furnace (Figure 1-7) while flyash can be removed by means of cyclones, scrubbers, baghouses, electrostatic precipitators and other particulate collection devices. As shown in Figure 1-7, bed material can be returned to the furnace. Loss of bed material with flyash is minimized by control of the suspension velocity in the furnace.

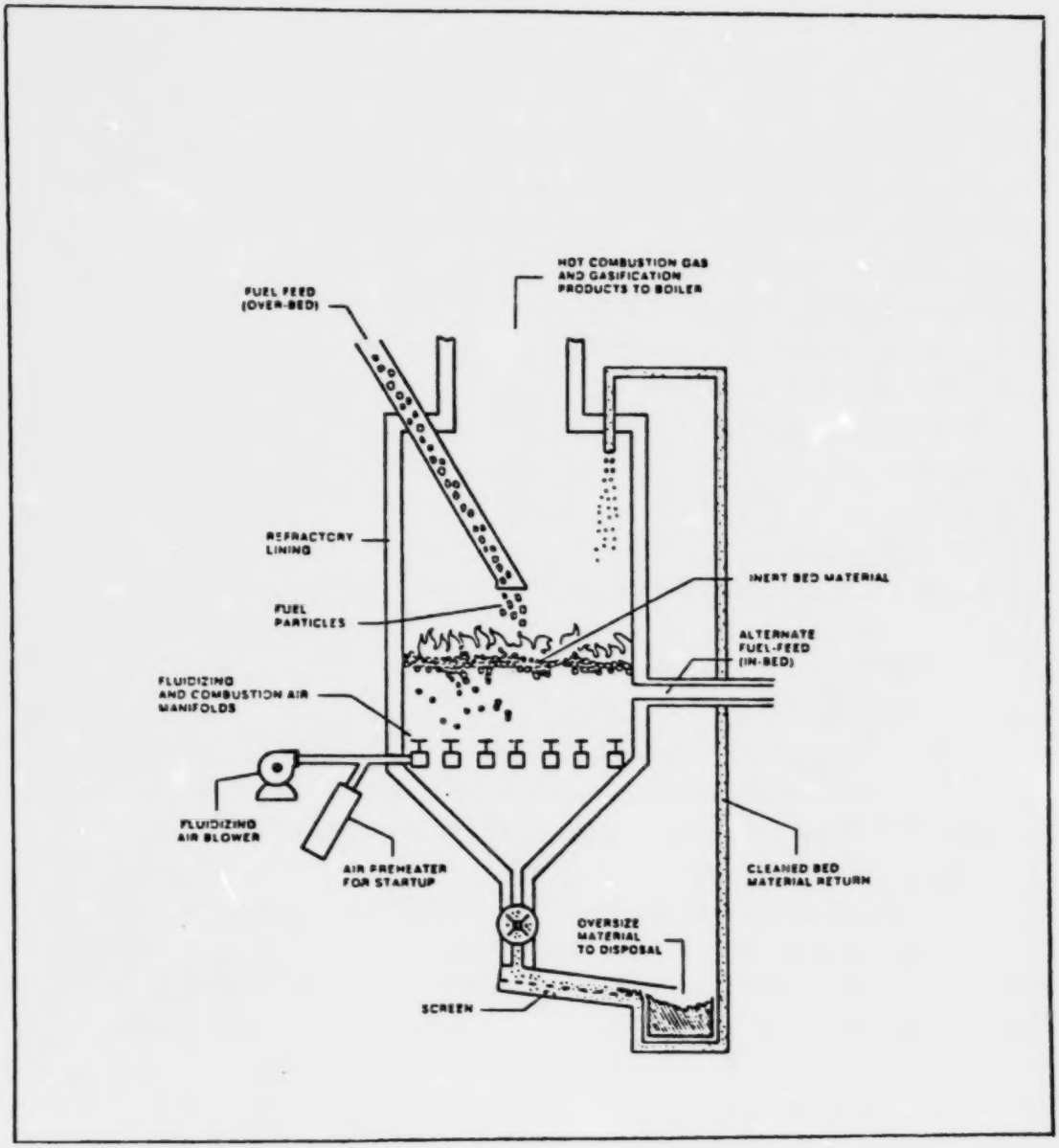


FIGURE 1-7

FLUIDIZED BED PEAT COMBUSTION

1.3 WASTE MANAGEMENT - MATERIALS AND HEAT BALANCES

131 SOURCES OF WASTES

The primary raw materials for operation of a steam cycle combustion power plant are fuel and combustion air. The plant also requires water for process use (including steam system makeup) and general plant services. In addition, water may be required, depending upon the design of the plant, for removal of ash and rejected heat. Wastes resulting from the processing of these materials to produce power (electrical) include:

- gaseous emissions, primarly flue gas containing products of combustion in addition to fly ash and moisture from drying of the fuel
- bottom ash
- liquid and other wastes consisting primarily of water treatment sludges, spent ion exchange regenerants, sewage, blowdowns, plant drains, and periodically produced boiler and non-boiler cleaning wastes
- rejected heat

Heat is rejected primarily with the flue gases and in the steam cycle condenser cooling water.

These sources of wastes are common to combustion of the various thermal fuels, peat, wood, coal and oil. However, the quantity and composition of these wastes varies in accordance with the properties of the fuels as discussed below.

132 QUANTITY AND COMPOSITION OF WASTES

.1 Material and Heat Balances

Material and heat balances, which provide estimates of raw materials and wastes for 1 MW to 100 MW (electrical output) power plants, are given in Figures A1-1 to A1-6 for peat, wood, coal and oil. The estimates are based on nominal properties for the various fuels (Table 1-4) and inhouse design data for their combustion. Thermal efficiencies are based on inhouse data for full scale operations.

Balances for capacities in excess of 100 MW have not been developed since most of the peat fuelled power plants in operation (i.e. Finland, USSR) do not exceed this capacity. In addition, the thermal efficiency tends to level off at this capacity and hence balances for larger units can be approximated by direct interpolation of the values for 100 MW capacity.

.2 Fuel Requirements

As shown in Figures A1-1 to A1-3, operation of a peat or wood fuelled power plant requires a considerably greater quantity of fuel than for operation of a coal or oil fired system with an equivalent capacity. This is directly attributable to the high moisture content of peat and wood (Table 1-4), their relatively low heat values (dry basis) and the lower thermal efficiency of peat and wood fired power plants.

.3 Combustion Air

Air requirements for the combustion of the various fuels are given in Figures A1-1 to A1-6. The quantities of air are based on the ultimate analyses and excess air requirements given in Table 1-4.

TABLE 1-4

Nominal Fuel Characteristics[a] For Waste Management
Material and Heat Balances

	Peat	Wood	Coal[b] (Bituminous)	Oil
Moisture Content (wt%)	50	40	6	0.2
Calorific Value Wet basis (MJ/kg)	11	10	30	43
Ultimate Analyses (wet basis)				
Carbon (wt%)	27.5	30	72.4	85.3
Oxygen (wt%)	17.5	25.2	4.7	0.40
Hydrogen (wt%)	2.5	3.6	4.7	11.2
Sulfur (wt%)	0.1	0.06	2.8-5.6	0.5-6.3
Nitrogen (wt%)	0.5-1.4	0.1-0.3	0.75-1.1	0.20-0.3
Ash (wt%)	1-5	0.6-1.2	9.4	0.1
Excess Air for Combustion (wt%)	25	25	20	5

[a] Refer to Appendix I for further information concerning fuel characteristics.

[b] Nova Scotia bituminous coal

.4 Process Water

As indicated in Figures A1-1 to A1-6, the requirement for process and general service water would be expected to be relatively independent of the various fuels, at equivalent plant capacity.

.5 Gaseous Emissions

.51 Quantity The major gaseous emission consists of flue gas discharged from the furnace. This gas as previously noted consists of uncombusted fuel, the products of combustion, particulates, and vapour evolved during drying of the fuel. As much as 80 percent of ash from the various fuels would be expected to be discharged as flyash. Flyash is considered in Section 132.6. Emission of tracemetals is considered in Section 132.7.

At equivalent plant capacities, combustion of peat and wood generates greater quantities of flue gas than for coal and oil (Figures A1-1 to A1-6). This follows directly from the greater quantities of peat (or wood) and combustion air required to generate equivalent power relative to the use of coal or oil.

.52 Water Vapour and Carbon Dioxide The relatively high content of water vapour in gaseous emissions from peat and wood fired power plants is due to the moisture content of the fuel (Table 1-4). The higher contents of carbon dioxide in gaseous emissions from peat and wood fuelled power plants, relative to coal and oil fired plants of equivalent capacity, can be attributed to the lower heat value of the former fuels.

.53 Sulfur Dioxide The material balances indicate that the emissions of sulfur, primarily as sulfur dioxide, are similar for combustion of

peat and wood. The balances also show that emissions of sulfur dioxide for a peat fuelled power plant would be markedly less (by a factor of 10 to 25) than for a coal fired plant of equivalent capacity and coal sulfur content of 2.8 to 5.6 weight percent. At low coal sulfur content (i.e. 0.5 wt%), the emissions of sulfur dioxides are similar in quantity for peat and coal fuelled power plants of equivalent power generation capacity. Compared to the use of oil, emissions of sulfur dioxide from a peat fired power plant are similar or less in quantity, depending upon the sulphur contents of the oil and peat.

The comments inferred from the material balances as regards emissions of sulfur dioxide are consistent with the findings of a recent power plant monitoring study carried-out in Finland (Häsänen, 1982). The monitoring study has shown that, "when pure peat is used the sulfur dioxide emissions are about 1/5 of those of coal fired power plants and about 1/10 of those of power plants fired with heavy fuel oil". This conclusion was based on firing of coal with approximately 1 weight percent sulfur content. The sulfur content of peat used in Häsänen's study was 0.05 to 0.3 weight percent.

A comparison of measured sulfur dioxide emissions (Häsänen, 1982) with those calculated for the various fuels, of the characteristics given in Table 1-4, are given in Table 1-5. The measured and calculated values are within reasonable agreement on an equivalent fuel sulfur content basis.

.54 Nitrogen Oxides Oxidation of nitrogen (N_2) present in the combustion air as well as oxidation and degradation of nitrogen containing substances in fuels are the sources of nitrogen oxides in gaseous emissions from combustion processes.

TABLE 1-5

Power Plant Sulfur Dioxide Emissions

	SO_2 Emissions			
	Peat	Wood	Coal	Oil
	mg/MJ	mg/MJ	mg/MJ	mg/MJ
Measured (Häsänen, 1982)	95-700 [a]	-	500-670 [b]	970-1020 [c]
Calculated (for fuels in Table 1-4)	200	120	1600-4000 [b]	200-1900

mg/MJ - mg SO_2 per MJ heat content of fuel

[a] - sulfur content of peat, ~0.05 to 0.3 wt%

[b] - sulfur content of coal, ~1 wt%

[c] - sulfur content of oil not given in source of data

The degree to which nitrogen in combustion air can be oxidized to nitrogen oxides is strongly dependent upon the temperature and oxygen content during the combustion process. Nitrogen (N_2) is one of the most stable compounds known (Heat of dissociation ∿1 MJ/gmole) and hence is extremely resistant to oxidation. In this regard it can readily be shown that oxidation of nitrogen (N_2) in the combustion air would not be expected to be a significant source of nitrogen oxides during combustion of fuels such as peat and wood. This can be attributed to the relatively low combustion temperatures characteristic of the combustion of peat and wood. The adiabatic flame temperature for the combustion conditions given in Figures A1-1 to A1-6 would not be expected to exceed approximately 900°C. At such temperatures, the rate of oxidation would be extremely limited resulting in negligible generation of nitrogen oxides under normal furnace residence times (Wark and Warner, 1976).

Thus, oxidation of reduced nitrogen containing substances and degradation of oxidized nitrogen-containing substances, in the fuel, would be expected to be the major sources of nitrogen oxide emissions during combustion of peat (and wood) at relatively low temperatures. Recent research (CA, 95:172367C) has provided some information concerning the formation of nitrogen oxides from nitrogen in peat. Unfortunately a copy of the report could not be obtained during the course of this study.

Some indication of the potential of nitrogen oxide formation can, however, be obtained from the results of the Finnish investigations referred to in Section 1.1 and the nitrogen content of the various fuels. A comparison of measured nitrogen oxide emissions (Häsänen, 1982) with those calculated for the various fuels, of the characteristics given in Table 1-4, are given in Table 1-6. The calculated emissions for peat are far in excess of values reported by Häsänen (1982) based on monitoring of peat fuelled power plants. Aside from other factors, the difference to a large degree may be due to the limited extent to which nitrogen in peat

TABLE 1-6

Power Plant Nitrogen Oxide Emissions

	NO_x Emissions as NO for			
	Peat	Wood	Coal	Oil
	mg/MJ	mg/MJ	mg/MJ	mg/MJ
Measured (Häsänen, 1982)	80-160	-	280-360	100-105
Calculated (for fuels in Table 1-4)	1000-2900	200-600	500-800	100-150

mg/MJ - mg NO per MJ heat content of fuel

can be oxidized. Those substances in peat which contain nitrogen at oxidation states lower than that of diatomic nitrogen (N_2) would most probably be oxidized to diatomic nitrogen gas. Further oxidation would not be expected due to the limitations imposed by the combustion temperature as previously noted. Those substances containing nitrogen at higher oxidation states than the diatomic gas could very well be degraded or further oxidized to produce nitrogen oxides. Sufficient information concerning the chemistry of nitrogen in peat is not readily available (Washburn and Gillis, 1982) to allow for consideration of this factor as a possible limitation to the formation of nitrogen oxides.

.55 Polycyclic Aromatic Hydrocarbons Polycyclic aromatic hydrocarbons (PAH) are a relatively volatile series of compounds which are known to form at least in trace amounts during the combustion of biomass and fossil fuels. These compounds may also be present in fuels such as peat (Washburn and Gillis, 1982). PAH are considered to be carcinogenic and therefore are of concern. In addition to PAH, there may be other hydrocarbons emitted if combustion is incomplete or if compounds resistant to combustion form during the burning of biomass fossil fuels (Finlay, 1983).

Recent investigations have considered the emission of PAH during the combustion of peat (Häsänen, 1982; Häsänen and Pohjola, 1982; Alsberg and Stenberg, 1979; Nichols et al, 1981). Häsänen and coworkers report, on the basis of peat fuelled power plant monitoring studies, that "no greater differences occur between the coal or peat fired power plants" (Häsänen, 1982). However, Häsänen also notes that for small peat fired installations (i.e. <1 MW) the emissions of PAH are as much as 1000 times greater per unit of peat than for "large" power plants. This may be due to the inefficient combustion conditions in the small furnaces resulting in incomplete combustion of peat with consequent emission of PAH.

The investigations carried-out by Alsberg and Stenberg (1979) using a 2 MW, peat or wood fuelled boiler have shown the extent to which PAH are formed during combustion of these fuels. At combustion temperatures varying between approximately 800°C and 1000°C, both peat and wood (90% birch) resulted in the emission of a series of PAH. The combustion of peat produced considerably more PAH (order of 700 µg/MJ heat content of peat) than the combustion of wood (order of 100 µg/MJ heat content of wood). The predominant polycyclic aromatics produced during the combustion of either peat or wood were, in order of quantity: phenanthrene, fluoranthene and pyrene. The significantly greater emissions of PAH for peat was attributed in part to variations in temperatures during conbustion which could favour the emission of these compounds. The investigations also indicated that relatively high molecular weight PAH are more likely to be emitted during the combustion of peat than for the combustion of wood.

As a general comment, the relatively low combustion temperatures characteristic of the use of peat as a fuel would be expected to be detrimental to oxidation and degradation of PAH evolved from the peat or formed during combustion.

.6 Ash

The quantities of ash produced from the combustion of peat, wood, coal and oil are given in Figures A1-1 to A1-6. Most of the ash would be discharged from the furnace as flyash. The remainder would be discharged as bottom ash. The combustion of peat and coal would produce greater quantities of ash than combustion of wood and oil, at equivalent plant capacity. This follows directly from the ash content of the various fuels given in Table 1-4.

The major consitituents of the ashes of peat and coal are somewhat similar, consisting of the oxides of silicon, aluminum, calcium,

iron, sodium and potassium. The major constituent of wood ashes (free of any unburnt char) is calcium oxide, with lesser amounts of potassium, magnesium and iron oxides. Contact of these ashes with water produces slightly acidic to highly alkaline solutions depending upon the content of readily soluble alkaline oxides. Unlike wood ash, the ashes of peat, coal and oil are sources of many metallic and non-metallic elements (Washburn and Gillis, 1982; WPCD, 1980; EPS, 1979; Power, 1977). The emission of metallic and non-metallic elements is considered further in the following section.

Removal of bottom and fly ashes from the furnace for disposal is considered in Section 132.9

.7 Trace Elements

Peat, coal and to a lesser extent oil, can contain many of the light, heavy and non-metallic elements listed in the periodic table. Peat, in particular, has a very strong capacity for the adsorption and chelation of metallic elements (Washburn and Gillis, 1982). Numerous investigations have considered the emissions of metallic elements during the combustion of coal (WPCD, 1980). Most elements are retained by the ashes. However, the more volatile elements, such as mercury, selenium and the halogens are emitted, at least in part, as vapours.

The preliminary results of the Finnish power plant monitoring studies (Häsänen, 1982) provide some indication of the distribution of trace elements between bottom and fly ashes during the combustion of peat (Table 1-7) as well as a comparison of total emissions to those from the combustion of coal and oil (Table 1-8). The final report of the Finnish investigations, which should be available in the near future, should present trace metal material balances for combustion of peat or provide sufficient information to enable completion of such balances.

TABLE 1-7

Distribution of Some Trace Metals and Radioactivity in Bottom and Fly Ashes from Combustion of Peat[a]

Trace Element	Peat	Bottom Ash	Fly Ash
As (mg/kg)	2	4	80-250
Be "	0.1	2	3
Cd "	0.2	1	6-15
Co "	0.9	4	23-130
Cr "	10	31	85-8600
Hg "	0.05	0.06	1.5-8
Mn "	37	350	1600-2800
Pb "	11	35	360-430
V "	5	29	290-700
Zn "	11	50	290-1300
Th "	0.5	4	12-14
U "	0.3	0.8	6-14
Po-210 (Bq/kg)	30	5	1100-1800

Source: Häsänen, 1982

mg/kg - mg element per kg (dry) of peat, bottom ash or fly ash

[a] type of furnace was not reported in source of data; most probably a suspension combustion type

TABLE 1-8

Emissions from Power Plants of Some Trace Metal and Radioactivity Elements

Trace Element	Milled Peat[b]	Sod Peat[c]	Coal[d]	Oil[e]
Efficiency of Particulate Removal (%)[a]	71-99.5	71-81	95.6-99.5	-
As µg/MJ	0.3-8	2-10	1-39	1.5
Be "	0.05-0.3	0.07-1.5	0.3-5	0.004
Cd "	0.002-1.2	0.8-4	0.1-2	0.008
Co "	0.3-79	0.06-0.2	1-22	3.4
Cr "	3-79	0.6-3	3-230	3.0
Hg "	0.1-0.5	0.1	0.02-0.1	0.0014
Mn "	9-340	17-31	2-230	14
Ni "	33-65	1-6	8-170	310-540
Pb "	3-190	39-195	8-115	4.9
V "	4-380	0.7-7	10-88	13100
Zn "	6-62	7-37	21-220	15
U "	0.1-1.6	0.01-0.1	0.2-4	0.15
Th "	0.1-5	0.03-0.2	0.4-7	0.05
Po-210 Bq/MJ	0.03-0.4	0.03-0.4	0.004-0.06	-

Source: Häsänen, 1982

µg/MJ - µg element per MJ heat content of fuel
[a] - type of particulate removal device was not reported in source of data
[b] - suspension combustion furnace
[c] - grate combustion furnace
[d] - suspension combustion, type of coal not reported in source of data
[e] - heavy fuel oil

This will provide a more complete understanding of the behaviour of these elements during combustion.

Based on the results of power plant monitoring, Häsänen (1982) has suggested that, with the possible exception of mercury, cadmium and lead, emissions of trace elements are somewhat lower for the combustion of peat than for coal, at equivalent plant capacity. Emissions of mercury, cadmium and lead are of the same magnitude or somewhat higher for peat than for coal. Similarly, emissions of uranium and thorium are lower for the combustion of peat than for coal. The emission of poloniuom-210 is higher for peat than for coal.

.8 Liquid and Other Wastes

As indicated in Figures A1-1 to A1-6, the quantity of liquid and other wastes would be expected to be relatively independent of the various fuels, at equivalent plant capacity. Similarly, the composition of the various wastes would be expected to be relatively independent of the type of fuel.

The characteristics of steam plant process and auxilliary water use wastes are well known (Power, 1977, 1978; WPCD, 1980; EPS, 1979). In general, the wastes consist of:

- raw water treatment sludges
- demineralizer system spent regenerants
- condensate polisher spent regenerants
- boiler blowdown
- precipitator wash down and scrubber effluents
- cooling tower blowdown (if appropriate)
- cleaning wastes (boiler water side, fireside and air-preheater)
- floor and yard drains

- fuel storage area drains
- sewage
- laboratory
- wastes from any other miscellaneous water uses.

In addition to these process and auxilliary water-use wastes, ash sluice water and condenser cooling water may also be discharged as liquid wastes. The quantities of water for these purposes are not shown in Figures A1-1 to A1-6 but are considered in Sections 132.9 and 132.10 respectively.

The process and auxilliary water use wastes (Power, 1977; WPCD, 1980) tend to be contaminated with any or all of the constituents such as: suspended solids, turbidity, oils and grease, free acidity and alkalinity, high concentrations of dissolved solids, organic based cleaning and water treatment agents, and metallics leached during cleaning operations, removed from the raw water during demineralization processes, and added as water treatment chemicals (i.e. alum, chromium).

.9 Ash Sluice Water

Ash from the combustion of peat, wood, coal and oil can be conveyed to ultimate disposal by either "dry-haul" or "wet" methods or a combination of these (WPCD, 1980; EPS, 1979). Thus, the net water required for disposal of ash can vary from a minimal amount to the order of 900 wt% or more of the quantity of ash for once-through ash sluice systems. Considerable effort has and is being made to minimize the net quantity of water required for disposal of ash. Methods have included conversion to dry-haul systems and implementation of water recycle to minimize if not eliminate discharge of water from ash sluice systems (WPCD, 1980).

No specific references were found during the literature search concerning the effects of peat ash on the quality of water. However, due to the similarity of the major constituents of peat and coal ashes (refer to Section 132.6), it would be expected that their effect on water quality is similar. The effects of coal ash on the quality of ash sluice water is well documented (WPCD, 1980; EPS, 1979; Tien-Yung et al, 1978). In general, ashes increase suspended solids, turbidity and the dissolved solids content of sluice water. In most cases the water becomes alkaline due to dissolution of alkaline oxides from the ash. However, some coal ashes result in acidic sluice water. In addition to these primary effects, trace elements may dissolve from the ash.

.10 Rejected Heat

Waste heat produced during power plant operation is rejected primarily with the flue gases and in the steam cycle condenser cooling water. Most of the heat is rejected in the condenser cooling water. The net water requirement can vary from a minimal amount (order of 0.5 t per MJ of waste heat) for those cases where closed loop cooling systems are used (i.e. cooling ponds and cooling towers) to the order of 22 t per MJ of waste heat for once-through cooling systems (11°C temperature rise). The methods for the rejection of waste heat are virtually independent of the type of fuel.

As shown in Figures A1-1 to A1-6, the rejected heat for operation of a peat fuelled power plant would be of the same order as that for the use of other fuels, at equivalent plant capacity.

1.4 POLLUTION CONTROL

It is evident from the preceeding assessment of wastes (Section 1.3) that the waste management considerations are very similar, if not

identical, for power generation by combustion of peat, wood, coal or oil. In this regard, current and developing pollution control practices applied to the numerous coal and oil fired power plants in Canada and elsewhere should be directly applicable to peat (and wood) fuelled systems. Pollution control practices with respect to the Canadian thermal power industry have been very well described in other reports (EPS, 1979; WPCD, 1980). The extent to which these or other practices are required will depend upon regulatory requirements with respect to any specific peat fuelled plants that are proposed. A summary of the waste management measures for peat fuelled power plants is given in Figure 1-8.

Gaseous emissions would be expected to be treated for the removal of particulates. Removal of particulates from peat combustion flue gases is widely practiced (e.g. Häsänen, 1982) using both mechanical collectors and electrostatic type precipitators designed for the specific characteristics of the particular flyash. The appropriate selection of these technologies (i.e. baghouses, cyclones, scrubbers) would enable removal of particulates to the required levels.

It is unlikely that gaseous emissions from peat combustion would require treatment for the removal of sulfur dioxide, due to the relatively low emissions compared to coal and oil fired plants (Section 132.53).

Similar considerations apply to emissions of nitrogen oxides. Combustion temperatures for peat fuelled power plants minimize the generation of nitrogen oxides. Further control over combustion conditions (temperature, excess oxygen) would be expected to have minimal effects on the emissions of nitrogen oxides while being detrimental to efficient and complete combustion of peat.

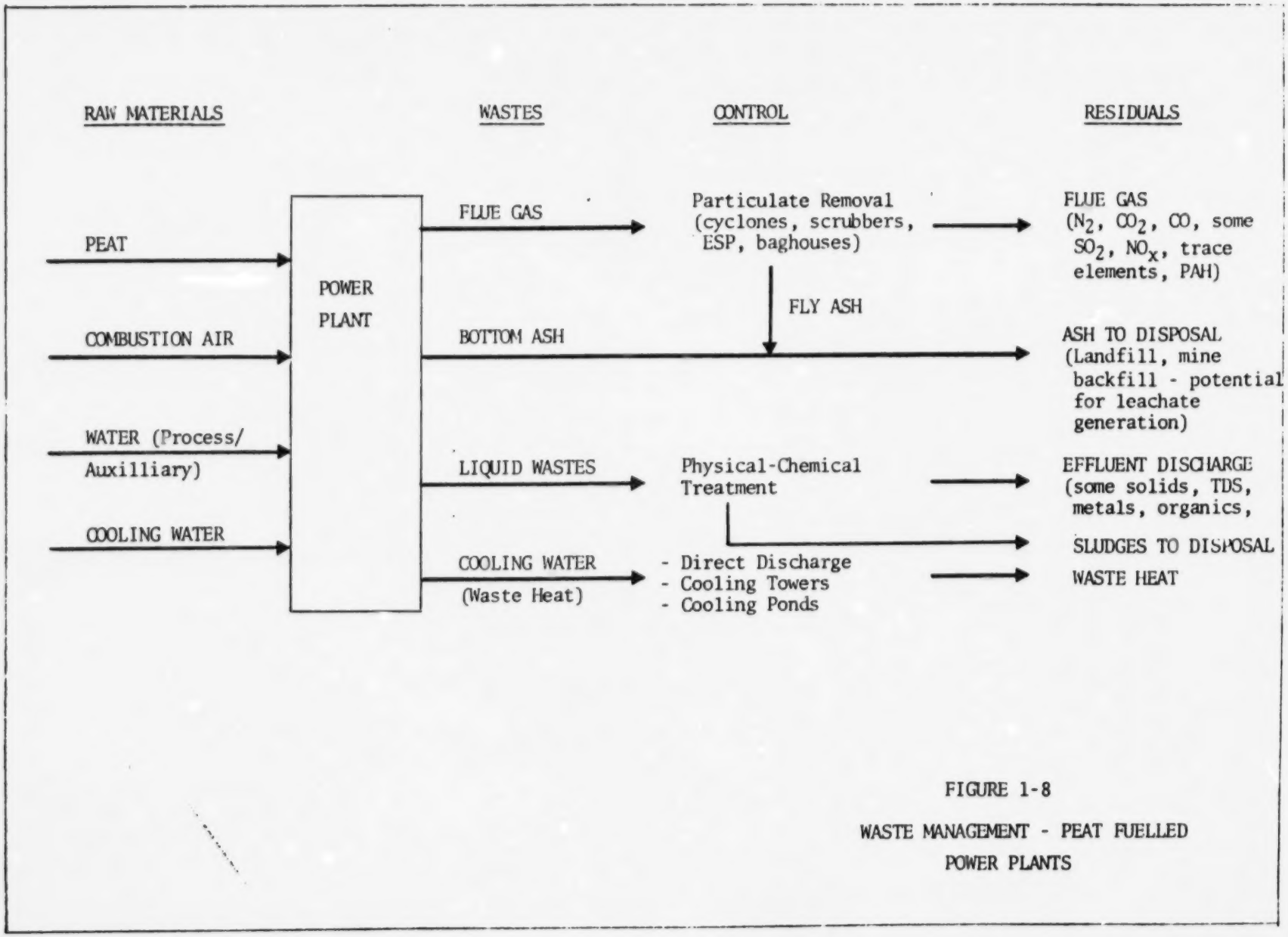
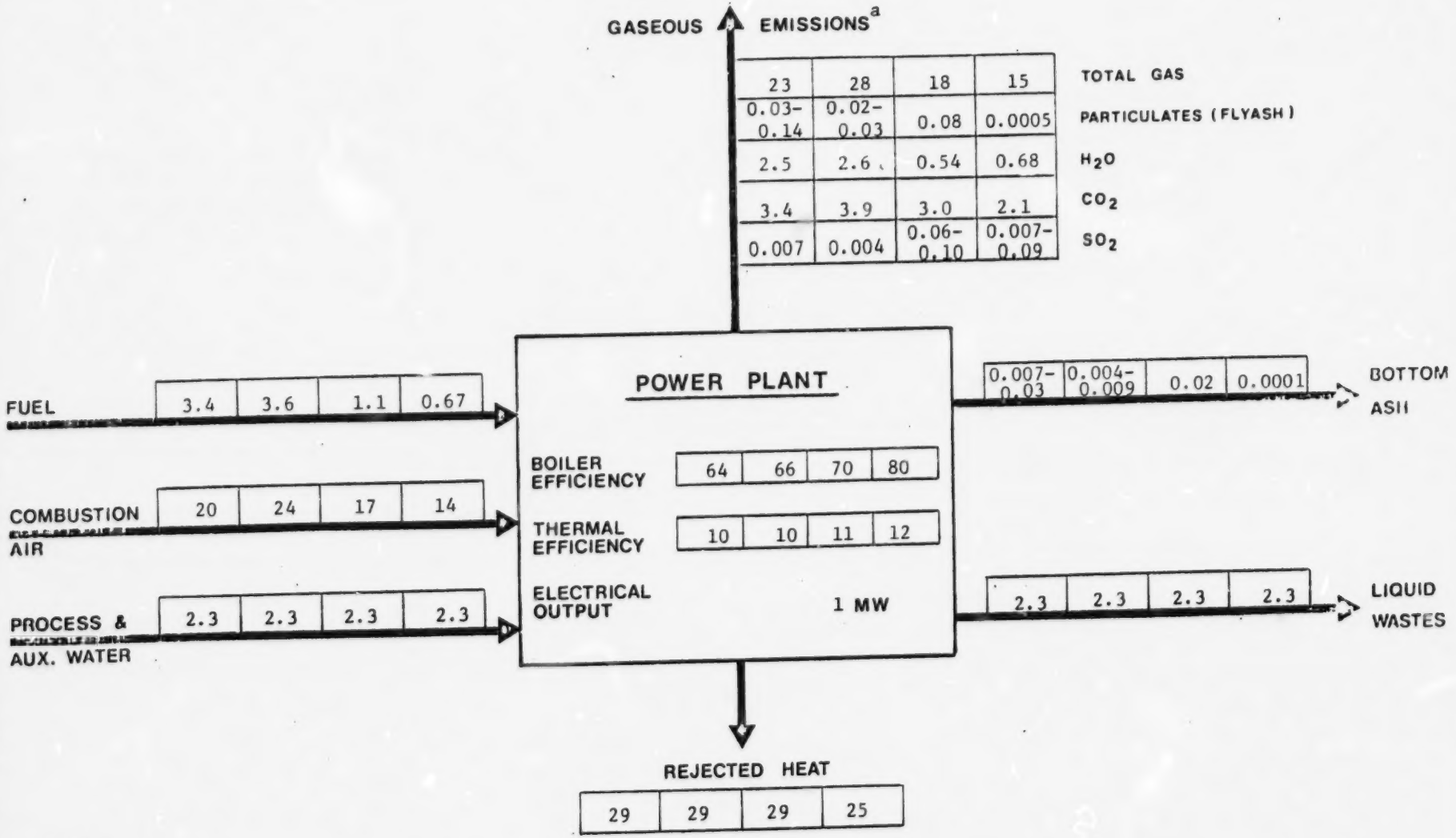


FIGURE 1-8

WASTE MANAGEMENT - PEAT FUELLED POWER PLANTS

The potential for the emissions of trace elements and polycyclic aromatic hydrocarbons (PAH) may warrant further consideration since treatment of thermal power plant flue gas for the removal of these is not known to be practiced. The emissions of PAH can be minimized by ensuring optimum conditions for complete oxidation (high temperature, secondary and/or excess air). However, as noted in Section 132.55, the relatively low peat combustion temperatures do not favour complete oxidation.

Minimization and treatment of liquid wastes (process and miscellaneous water uses), and ash disposal and cooling water effluents for peat fuelled power plants would be almost if not identical to well known practices with respect to the use of other fuels (WPCD, 1980; EPS, 1979).



TOTAL GAS	23	28	18	15
PARTICULATES (FLYASH)	0.03-0.14	0.02-0.03	0.08	0.0005
H_2O	2.5	2.6	0.54	0.68
CO_2	3.4	3.9	3.0	2.1
SO_2	0.007	0.004	0.06-0.10	0.007-0.09
FUEL	3.4	3.6	1.1	0.67
COMBUSTION AIR	20	24	17	14
PROCESS & AUX. WATER	2.3	2.3	2.3	2.3
BOILER EFFICIENCY	64	66	70	80
THERMAL EFFICIENCY	10	10	11	12
BOTTOM ASH	0.007-0.03	0.004-0.009	0.02	0.0001
LIQUID WASTES	2.3	2.3	2.3	2.3
REJECTED HEAT	29	29	29	25

Notes:

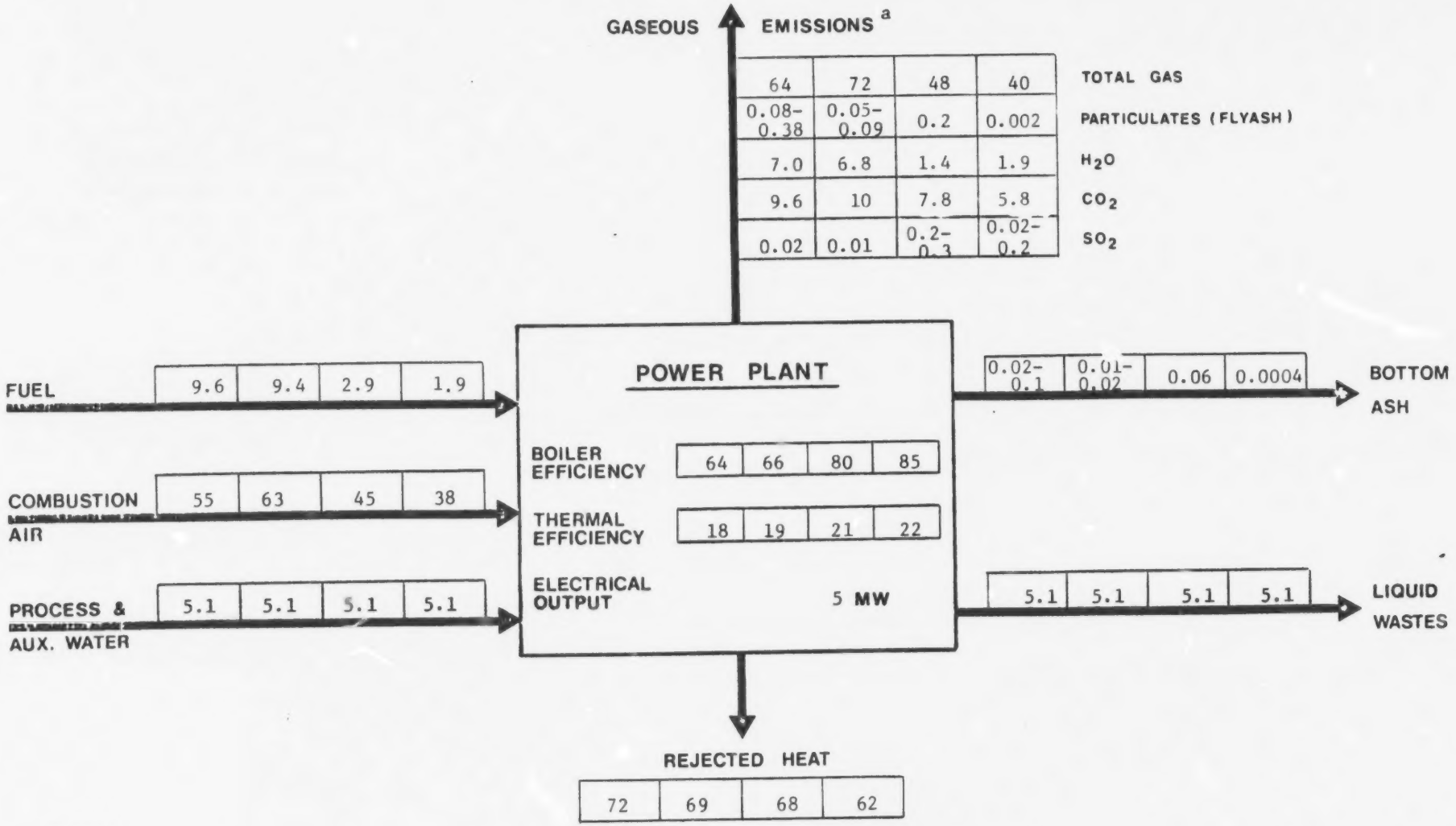
[a] - Furnace gas - prior to any pollution control systems

Peat	Wood	Coal	Oil

Units

Heat - GJ/h
Materials - t/h
Efficiency - %

FIGURE A1-1
WASTE MANAGEMENT
MATERIALS AND HEAT BALANCES
CAPACITY 1 MW


GASEOUS EMISSIONS a
64 72 48 40 TOTAL GAS
0.08-0.38 0.05-0.09 0.2 0.002 PARTICULATES (FLYASH)
7.0 6.8 1.4 1.9 H2O
9.6 10 7.8 5.8 CO2
0.02 0.01 0.2-0.3 0.02-0.2 SO2
POWER PLANT
FUEL 9.6 9.4 2.9 1.9
COMBUSTION AIR 55 63 45 38
PROCESS & AUX. WATER 5.1 5.1 5.1 5.1
BOILER EFFICIENCY 64 66 80 85
THERMAL EFFICIENCY 18 19 21 22
ELECTRICAL OUTPUT 5 MW
0.02-0.1 0.01-0.02 0.06 0.0004 BOTTOM ASH
5.1 5.1 5.1 5.1 LIQUID WASTES
REJECTED HEAT
72 69 68 62

Notes:

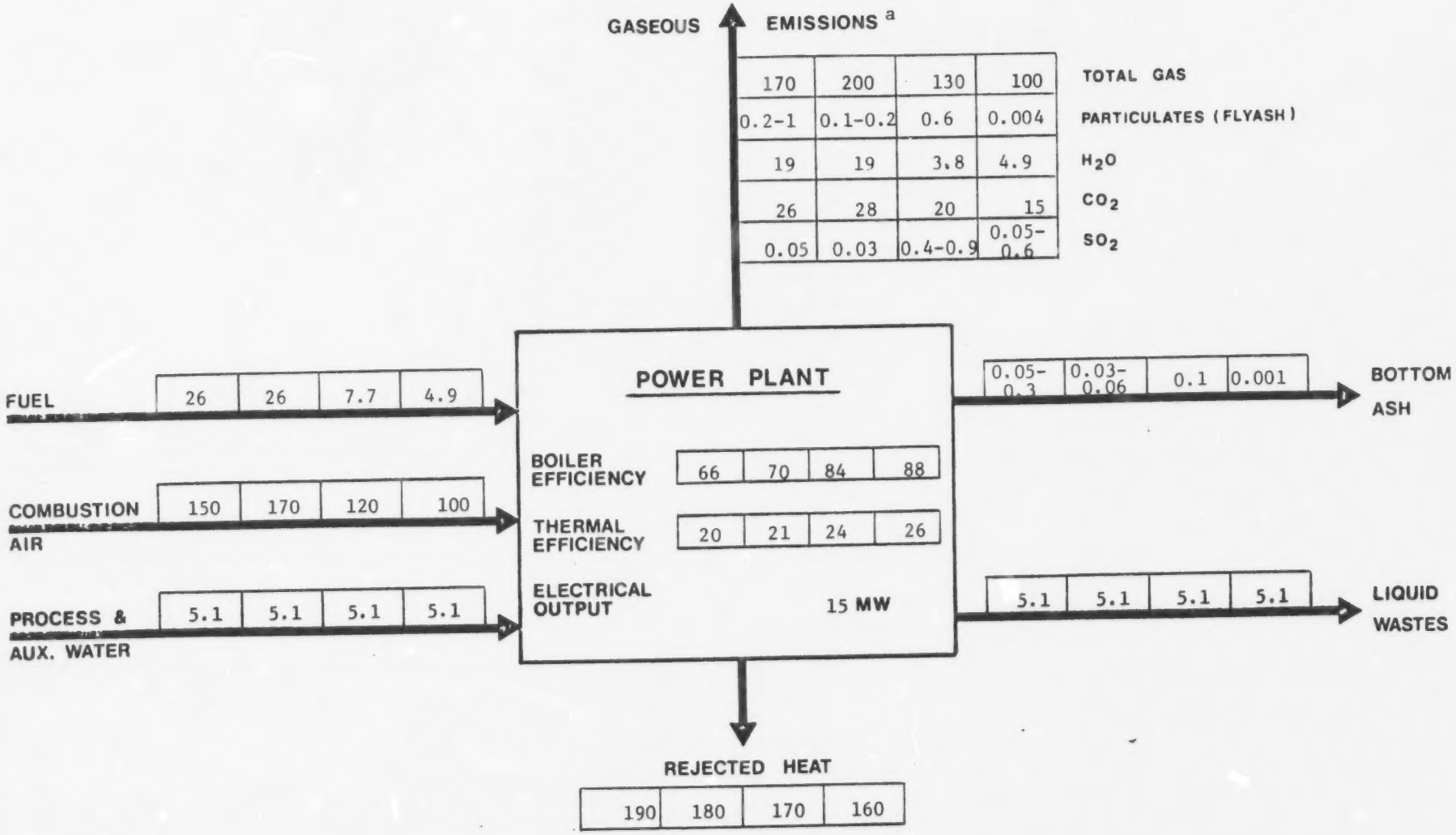
a - Furnace gas - prior to any pollution control systems

Peat	Wood	Coal	Oil

Units

Heat - GJ/h
Materials - t/h
Efficiency - %

FIGURE A1-2
WASTE MANAGEMENT
MATERIALS AND HEAT BALANCES
CAPACITY 5 MW


GASEOUS EMISSIONS a
170 200 130 100 TOTAL GAS
0.2-1 0.1-0.2 0.6 0.004 PARTICULATES (FLYASH)
19 19 3.8 4.9 H_2O
26 28 20 15 CO_2
0.05 0.03 0.4-0.9 0.05-0.6 SO_2
POWER PLANT
FUEL 26 26 7.7 4.9
COMBUSTION AIR 150 170 120 100
PROCESS & AUX. WATER 5.1 5.1 5.1 5.1
BOILER EFFICIENCY 66 70 84 88
THERMAL EFFICIENCY 20 21 24 26
ELECTRICAL OUTPUT 15 MW
0.05-0.3 0.03-0.06 0.1 0.001 BOTTOM ASH
5.1 5.1 5.1 5.1 LIQUID WASTES
REJECTED HEAT
190 180 170 160

Notes:

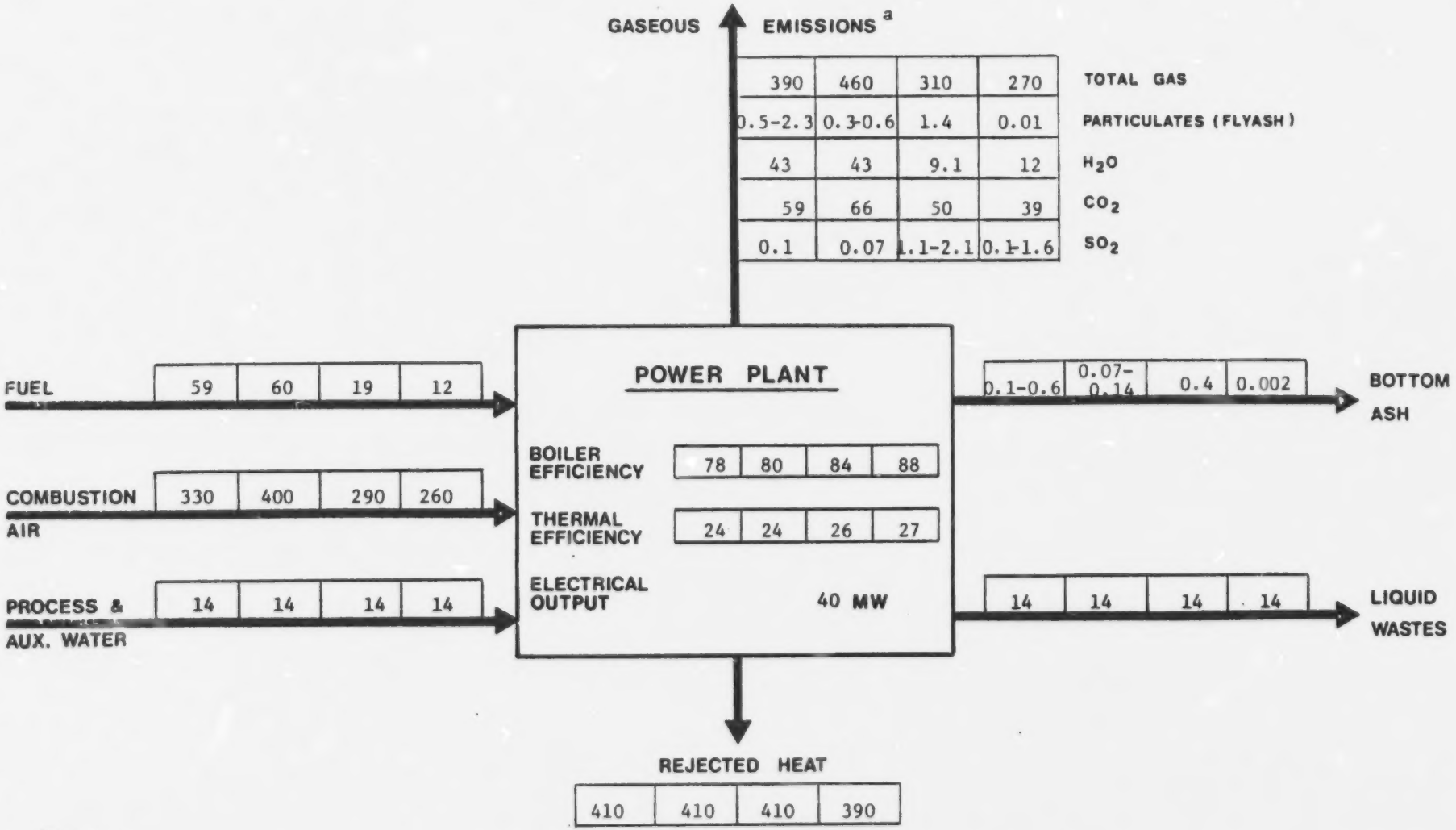
a - Furnace gas - prior to any pollution control systems

Peat	Wood	Coal	Oil

Units

Heat - GJ/h
Materials - t/h
Efficiency - %

FIGURE A1-3
WASTE MANAGEMENT
MATERIALS AND HEAT BALANCES
CAPACITY 15 MW


GASEOUS EMISSIONS a
390 460 310 270 TOTAL GAS
0.5-2.3 0.3-0.6 1.4 0.01 PARTICULATES (FLYASH)
43 43 9.1 12 H2O
59 66 50 39 CO2
0.1 0.07 1.1-2.1 0.1-1.6 SO2
POWER PLANT
FUEL 59 60 19 12
COMBUSTION AIR 330 400 290 260
PROCESS & AUX. WATER 14 14 14 14
BOILER EFFICIENCY 78 80 84 88
THERMAL EFFICIENCY 24 24 26 27
ELECTRICAL OUTPUT 40 MW
0.1-0.6 0.07-0.14 0.4 0.002 BOTTOM ASH
14 14 14 14 LIQUID WASTES
REJECTED HEAT
410 410 410 390

Notes:

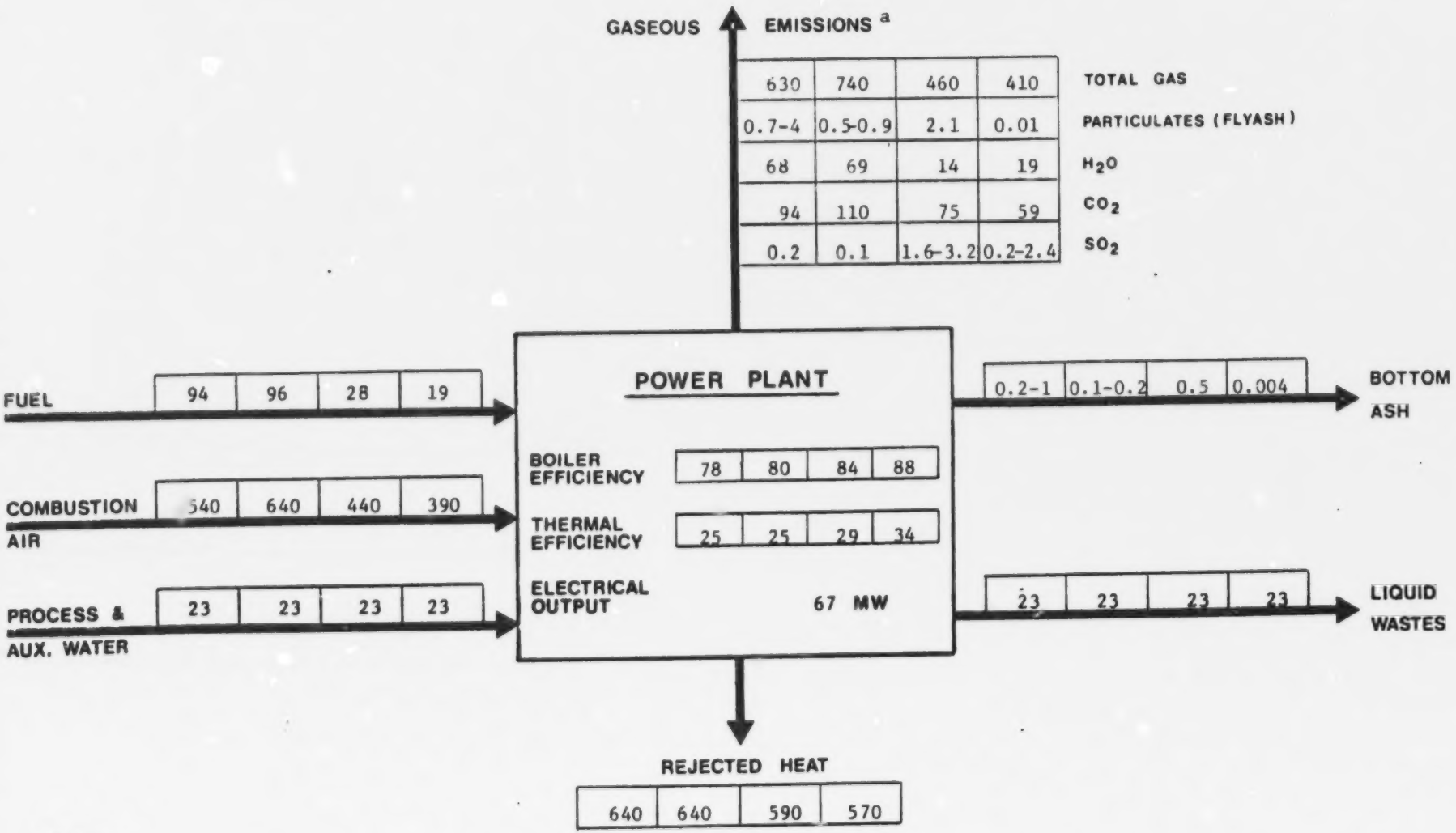
a - Furnace gas - prior to any pollution control systems

Peat	Wood	Coal	Oil

Units

Heat - GJ/h
Materials - t/h
Efficiency - %

FIGURE A1-4
WASTE MANAGEMENT
MATERIALS AND HEAT BALANCES
CAPACITY 40 MW



Notes:

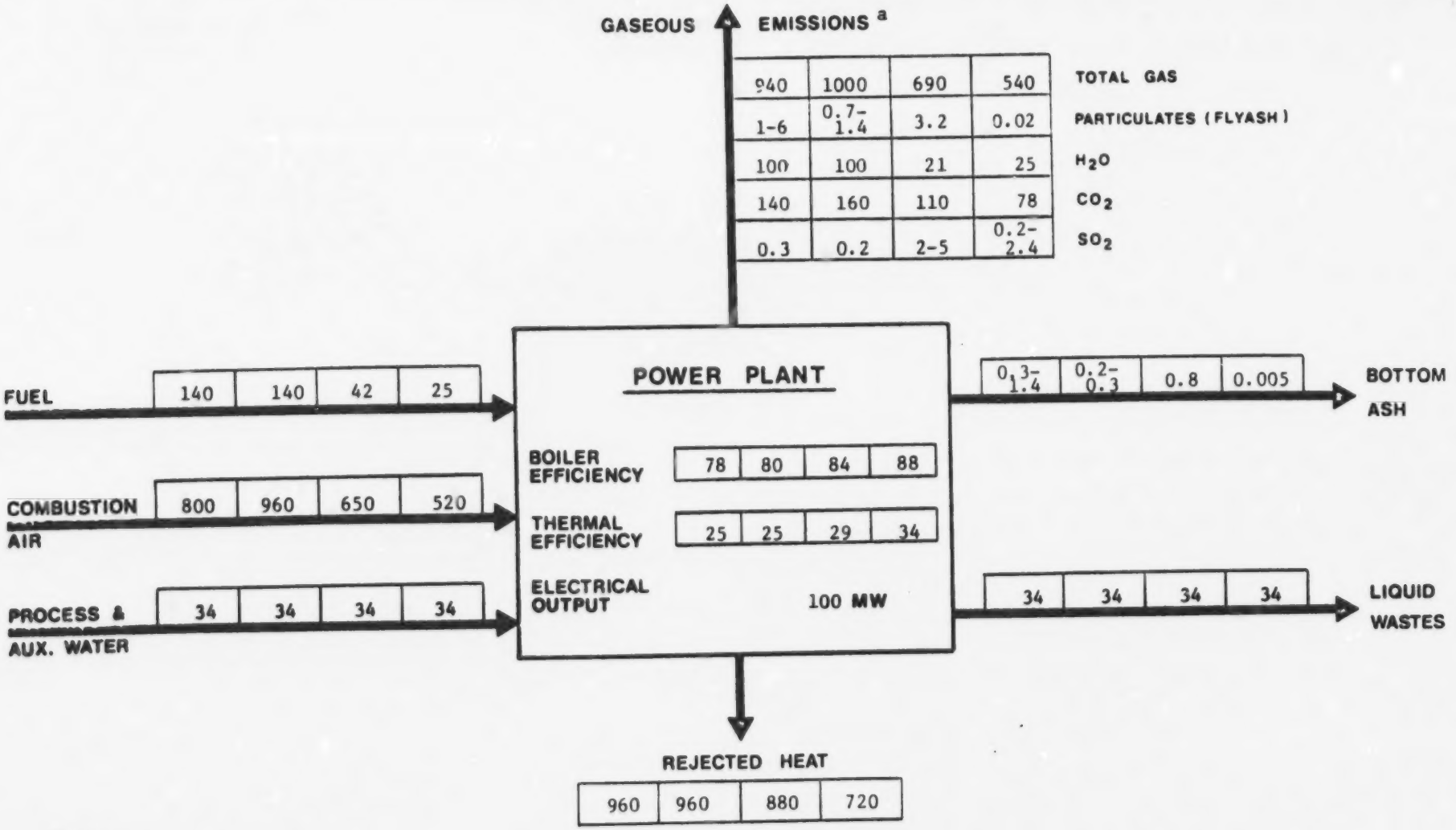
a - Furnace gas - prior to any pollution control systems

Peat	Wood	Coal	Oil

Units

Heat - GJ/h
Materials - t/h
Efficiency - %

FIGURE A1-5
WASTE MANAGEMENT
MATERIALS AND HEAT BALANCES
CAPACITY 67 MW


GASEOUS EMISSIONS a
940 1000 690 540 TOTAL GAS
1-6 0.7-1.4 3.2 0.02 PARTICULATES (FLYASH)
100 100 21 25 H2O
140 160 110 78 CO2
0.3 0.2 2-5 0.2-2.4 SO2
POWER PLANT
FUEL 140 140 42 25
COMBUSTION AIR 800 960 650 520
PROCESS & AUX. WATER 34 34 34 34
BOILER EFFICIENCY 78 80 84 88
THERMAL EFFICIENCY 25 25 29 34
ELECTRICAL OUTPUT 100 MW
0.3-1.4 0.2-0.3 0.8 0.005 BOTTOM ASH
34 34 34 34 LIQUID WASTES
REJECTED HEAT
960 960 880 720

Notes:

a - Furnace gas - prior to any pollution control systems

Peat	Wood	Coal	Oil

Units

Heat - GJ/h
Materials - t/h
Efficiency - %

FIGURE A1-6
WASTE MANAGEMENT
MATERIALS AND HEAT BALANCES
CAPACITY 100 MW

REFERENCES[a]

PEAT COMBUSTION

Alsberg, T. and V. Stenberg. 1979. Capillary GC-MS Analysis of PAH Emissions from Combustion of Peat and Wood in a Hot Water Boiler. Chemosphere, No. 7.

Bodle, W.W., D.V. Punwani and M.C. Mensinger. 1978. Re: Peat. Chemtech, September.

CA:95:172367C. Gibbs, B.M. E. Hampartsoumian. 1979. The Influence of Fuel Nitrogen and Volatiles Content on the Nitric Oxide Emission from the Fluidized Combustion of Solid Fuels. Inst. Energy Symp. Ser. (London) 1980, 4(Fluid Combustion, Sept. Appl.). V/2/1-V/217. Chemical Abstracts reference CA:95:172367C (Volume 95, 1981).

EPS. 1979. Environmental Codes of Practice for Steam Electric Power Generation, First Draft. Environmental Protection Service, Canada.

Finlay, P. 1983. Environmental Protection Service, Ottawa. Personal Communication.

Häsänen, E. 1982. Emissions from Peat-Fired Power Plants. Section 10.2 of Peatlands and Their Utilization in Finland. Finish Peatland Society, Helsinki.

Häsänen, E. and T.V. Pohjola. 1982. Turvevoimalaitosten päästöt (Emissions from Peat-Fired Power Plants). Kemia-Kemi, No. 4.

Nichols, D.G., S.K. Cangwal and C.M. Sparacino. 1981. Analysis and Assessment of PAH from Coal Combustion and Gasification. Chemical Anal. and Biol. Fate: Polynuclear Aromatic Hydrocarbons, Int. Symp., 5th. 1980. Edited by M. Cooke and A.J. Dennis, Battelle Press, Columbus, Ohio. Published 1981.

Power. 1978. Optimize Your Wastewater Treatment. Power, December.

Power. 1977. Water Pollution Control in Steam Plants. Power, April.

Wark, K. and C.F. Warner. 1976. Air Pollution - Its Origin and Control. IEP A Dun-Donnelly Publisher. New York, N.Y.

Washburn and Gillis. 1982. Survey of Literature on the Assessment of the Pollution Potential of the Peat Resource. Report submitted to Environment Canada.

WPCD. 1980. Water Intake, Wastewater Production and Treatment, and Air Pollution Control Technology in Coal Fired Steam Electric Power Generating Stations. Report submitted to the Water Pollution Control Directorate of Environment Canada.

---

[a] For general bibliography refer to the report title issued to Environment Canada under separate cover dated April 1983.

Tien-Yung, J. Chu, R.J. Ruane and P.A. Krenkel. 1978. Characteristion and Reuse of Ash Pond Effluents in Coal Fired Power Plants. J.W.P.C.F. November.

PART 2

PART TWO

LIQUEFACTION AND GASIFICATION OF PEAT

PART TWO - LIQUEFACTION AND GASIFICATION OF PEAT

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2.1 INTRODUCTION

Liquefaction and gasification processes are used to produce fuels with an increased ratio of hydrogen to carbon relative to the hydrocarbon feedstock, such as coal, peat or other biomass. Thus, the processes result in fuels with higher unit heat value while removing, at least to some extent, impurities such as ash, nitrogen, sulphur and oxygen.

Gasification and liquefaction technologies have been developed primarily on the basis of coal as the feedstock (Wen and Lee, 1979). It is only during the past 10 years or so that the processing of peat to produce gas and liquid fuels has received considerable attention. Thus, while numerous reports are available concerning process development (refer to General Bibliography), there is a lack of information concerning the waste management implications of peat liquefaction and gasification technologies. Hence, it has been necessary to derive the pollution potential for peat processes from the information available for coal and, to a lesser extent, other biomass such as wood.

2.2 GASIFICATION AND LIQUEFACTION TECHNOLOGY

221 PEAT AS A FEEDSTOCK

Peat can be regarded as being similar to lower rank coals and other biomass (wood) as regards feedstocks for gasification, and to a somewhat lesser extent, liquefaction. The elemental composition of both peat, coal, and other biomass consists primarily of carbon, hydrogen and oxygen with lessor quantities of nitrogen, sulphur, ash forming constituents and other elements (Appendix I). Thus, as would be expected, processes for the liquefaction and gasification of peat are similar to those for coal and other biomass.

222 GASIFICATION TECHNOLOGY

.1 General

Comprehensive reviews of peat gasification technologies have been published by Leppamaki et al (1979), Solantuasta et al (1980) and Punwani (1980). Peat can be gasified according to the same principles as coal (Wen and Lee, 1979). Approximately forty gasification processes for coal are estimated to have been under development at the turn of the decade. Of these, fourteen processes have advanced to the level of large scale pilot plants. Tables 2-1 and 2-2 provide summaries of the pre-1979 experience of using peat as a feedstock in existing gasifiers designed for coal or wood (Leppamaki et al, 1979).

Application of coal gasification technology to peat feedstocks typically requires new designs of the storage, preparation and feeding system, and of the gasifier itself in order to accommodate the low density and low ash melting temperature of peat.

Gasification of peat or other biomass normally requires four major process operations:

- feed pretreatment
- gasification
- raw gas cleaning, and
- gas beneficiation.

Pretreatment of peat may consist of processes such as drying, wet carbonization, briquetting or pulverization. After pretreatment, the fuel enters the gasification reactor, where it reacts with oxygen and steam to produce combustible gas. Air is used as the oxygen source for making gas of relatively low heat value (<9MJ/m^3). Pure oxygen is used to produce medium (9-20 MJ/m^3) or high heat value (>33 MJ/m^3) gas.

TABLE 2-1

SUMMARY OF PEAT GASIFICATION PROCESSES

1) LHVG: Low Heat Value Gas
MHVG: Medium Heat Value Gas

Process	Reactor type	Gasification material	Peat type	Product 1)	By-product	Comments
Lurgi	Fixed bed pressure generator	Steam-oxygen/steam air	Particle size 3-8 mm, moisture 20-22%, melting point of ash 1100°C	LHVG	Tar, oil light liquid hydrocarbons	Good efficiency plenty of by-products
Koppers-Totzek	Entrained fuel gasifier	Steam-oxygen	Milled peat, particle size 0,1 mm	LHVG	None	Efficiency
Winkler	Low-pressure fluidized bed	Steam-oxygen/steam air	Milled peat, particle size 9,5 mm	MHVG - LHVG	None	Peat gasification is difficult without careful pre-treatment
Soviet generator	Fixed bed	Air-steam	Sod peat	LHVG	Tar	Great experience on an industrial scale
Panindco	Entrained fuel gasifier	Steam-oxygen/steam air	Dust	MHVG		Applicable to peat gasification
Didier-Bubiag	Fixed bed with a separate coke gasifier	Steam	Sod peat, moisture 25%	MHVG	Tar, heavy hydrocarbons	Many narrow retorts and auxiliary gasifiers cause high investments
WEDA-Wood gasifier	Fixed bed	Air	Sod peat	MHVG	Tar, phenols	Many by-products
Kimpflin Peat gasifier	Fixed bed	Air	Moisture 85% 2)	MHVG		Feed equipment clogs no plant in operation
Lurgi-Ruhrgas	Entrained fuel gasifier with heated pebbles	Steam	Particle size 2 mm	MHVG	Tar, coke	In modern versions coke is circulated instead of pebbles, gas purification
Soviet modification of the Lurgi-Ruhrgas	Entrained fuel gasifier with heated pebbles	Steam	Moisture 15-20% particle size 2-13 mm	LHVG, MHVG	Dry distillation products	Tar may cause clogging in the size system
Distibois	Fixed bed	Steam-air	Peat briquettes moisture 23%	MHVG	Tar, residue (50% carbon)	Solid briquettes are a top expensive material
Flesch-Donag	Two fluidized beds used intermittently	Steam-oxygen/ steam air	Particle size 0-10 mm, ash content 35%, moisture 10% (15%)	LHVG, MHVG	None	Difficult, expensive process
Pintsch-Hillebrand	Fixed bed with water-gas generator	Steam	Sod peat	MHVG	Tar	There will be difficulties because of tar

Source: Leppemaki et al, 1979

TABLE 2-2

SUMMARY CONCERNING THE PRODUCTS AND CIRCUMSTANCES OF PEAT GASIFICATION

Process	Consistency of dry gas, vol-% [13] CO_2	H_2S	$C_n H_m$	O_2	CO	H_2	CH_4	N_2		Heat value dry gas MJ/cu.m	Produced gas cu.m/kg peat	Thermic efficiency [12] %
Lurgi	32.8 33.0	0.1 0.1	0.6 0.6	0.1 0.0	17.0 17.4	34.1 37.1	13.6 11.2	0.7 0.6	1) 2)	11.9 [5] 7.6 [6]	1.212	77 86
Koppers-Totzek	15.8 14.9	- -	- -	0.2 0.2	45.9 45.8	32.5 33.4	1.1 1.5	4.5 4.2	3) 4)	10.4 10.6	1.34 1.36	75 (11%) 75
Winkler [14]	20.6 7.0	- -	- -	- -	33.4 21.5	41.9 13.2	3.1 0.6	1.0 57.7	5) 6)	10.8 4.4		
Soviet Generator	8 15	-	-	0.0 1.0	15. 30	8 20	0.8 3.5	40 60		4.1 7.1	1.5 2.7	60.0 75.0
Panindco												64
Didier-Bubiag	12	-	0.2	0.2	27	52	1.5	7.1		15.4	1.066	
WEDA-wood gasifier	6.9	-	0.8	6.7	25.6	8.6	2.5	54.8	7)	5.8	1.79	70 75 (29.4%)
Kimpflin peat gasifier										5.13		
Lurgi-Ruhrgas										12.5 18.9		
Soviet modification of the Lurgi Runrgas	14 19.8		1.5 2.95	0.85 1.25	14.75 20	36 42.2	0.6 6.9			8.6 11.3		
Distibois	36.3	-	-	0.16	15.7	37	0.84	10.0		7.0	1.96	76 (12%
Flesch-Domag	8.0 11.0	- -	- -	- -	25.0 40.0	14.0 27.0	2.0 2.0	51.0 20.0	8) 9)	5.7 9.3		
Pintsch-Hillebrand	15.2 7.2	- -	0.3 -	0.2 -	26.7 39.4	53.4 50.9	2.5 1.3	1.8 1.1	10) 11)	10.1 11.5	1.283 1.350	69.2 63.0

Comments:
1) pressure about 20 bar
2) pressure about 15 bar
3) outlet temperature of gas 1200°C
4) outlet temperature of gas 1090°C
5) oxygen -steam
6) air-steam
7) moisture 29.4%
8) heating gas
9) NH_3 synthesis gas
10) peat moisture 30.27%
11) peat moisture 35.00%
12) for gas (25°C, 1 bar) and for peat moisture 10% unless otherwise mentioned
13) this column is lacking in data of Panindco, Kimpflin and Lurgi-Ruhrgas
14) information concerns coal gasification, no test material of peat gasification is available.

Source: Leppemaki et al, 1979

The gas from the gasifier contains varying concentrations of CO_2, CO, H_2, CH_4, acid gases, N_2, particulates and water. If the gas is beneficiated or used for liquids synthesis, four purification processes may be required:

- particulate removal; to eliminate dust, ash and tar aerosols
- tar and oil removal
- gas quenching and cooling; to condense tars and oils, scrub NH_3
- acid gas removal; to remove gases such as H_2S, carbonyl sulphide and carbon dioxide.

The purified gas can then be further processed by catalytic methods to adjust the H:C ratio (shift reaction) prior to synthesis of other hydrocarbons or methanation to produce high heat value gas.

There are also may auxilliary processes accompanying a gasification facility. Typical are the oxygen plant, power and steam plant, sulfur recovery unit, water treatment plant and cooling towers.

The major commercial gasification technologies are:

- Lurgi dry ash (fixed bed, updraft, pressurized)
- Koppers-Totzek (entrained bed, slagging, atmospheric)
- Winkler (fluid-bed, dry ash, atmospheric)
- IGT peat gas process.

These are described in the following section.

.2 Lurgi Gasifier

Gasification using the Lurgi Gasifier (Figure 2-1) is accomplished in a slowly descending fixed-bed vertical reactor. The largest reactor in operation is approximately 3.7 m in diameter. The reaction is carried-out at pressures of 1.0 to 3.0 MPa and temperatures of 620 to 760°C.

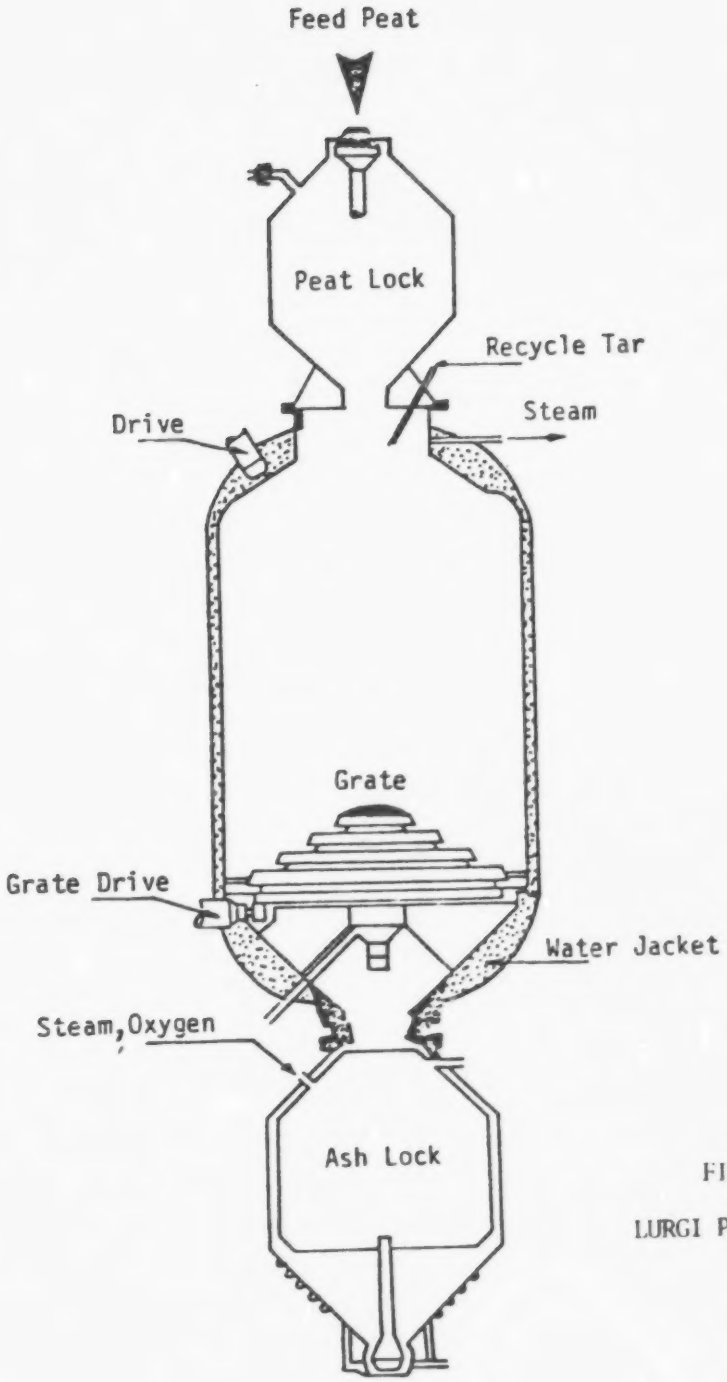


FIGURE 2-1

LURGI PEAT GASIFIER

The Lurgi gasification process has been used commercially with coal to produce low or medium heat value gas (depending upon whether the gasifier is air or oxygen blown) for more than 40 years. No commercial scale Lurgi reactors have been used for peat gasification.

Analysis of a typical gasifier product is presented in Table 2-3 (Leppamaki et al, 1979).

The feed peat (or coal) is introducted at the top through a lock-hopper system and spread evenly across the reactor by a rotating distributor. Superheated steam and oxygen are injected into the bottom of the reactor (Figure 2-1). The peat should contain less than 20% moisture be 0.3 to 10 mm in particle size, and have an ash fusion temperature greater than 1100°C to prevent deposits and slagging in the reactor.

Raw gas leaves the reactor at the top. As a result, tar ash and dust are mixed with the gas, and extensive clean-up is necessary before the synthesis gas can be further processed. The temperature of the outlet gases is between 370-600°C. The thermal efficiency of the Lurgi gasifier is about 70% on coal feedstock. The composition of the gas may be varied through the steam/oxygen ratio; air may be used instead of oxygen if low-heat value gas is desired.

The typically high methane and tar content of the gas makes the Lurgi gasifier of limited use in synthesis gas production, but close-coupled industrial boiler applications may be possible. Tar, oil, phenols and liquid hydrocarbons can be expected in the product gas because of the relatively low gasification temperature and the passage of the hot gases through the fuel bed which entrains pyrolysis products. More extensive gas cleanup would be necessary than for other higher temperature gasification processes.

TABLE 2-3

RESULTS OF GASIFICATION TESTS
CONDUCTED IN A LURGI GASIFIER WITH PEAT

Test No.	2	10
Operating Conditions:		
*Peat Feed Rate, kg.h	1057	943
Pressure, MPa	1.97	1.47
Operating Results:		
Liquid Products, kg/h		
Tar	58.5	43.0
Oil	13.4	9.34
Light Hydrocarbon Liquids	7.12	5.76
Gas Yield, m^3/kg	1.34	1.54
Gas Composition (Dry Basis), mol %,		
CO	17.0	17.4
CO_2	33.8	33.0
H_2	34.2	37.1
CH_4	13.6	11.2
C_nH_m	0.6	0.6
H_2S	0.1	0.1
N_2	0.7	0.6
Total	100.0	100.0

* Peat was gasified by a mixture of oxygen and steam under pressure.

Source: Leppamaki et al, 1979

.3 Koppers-Totzek Gasifier

The Koppers-Totzek reactor (Figure 2-2) is an entrained-flow gasifier consisting of a refactory-lined horizontal cylindrical vessel with two or more nozzles facing each other coaxially. Superheated steam, oxygen and finely ground coal (or peat) are fed into the reactor through the nozzles. The reactor operates at slightly above atmospheric pressure, at a temperature of approximately 1100°C, and provides a residence time of a few seconds.

The outlet temperature of the gas can be as high as 1600°C. As a result of the low pressure and high temperature, the outlet gas does not contain hydrocarbons, tar or phenols in any significant concentration. The ash is removed partly through the bottom of the reaction chamber and partly from the product gases in a cyclone and wet scrubber.

The Koppers-Totzek gasifier is flexible in operation; full production capacity can be reached in 30-60 minutes from startup. The thermal efficiency is about 75% using coal as a feedstock.

The results of some peat gasification tests carried-out using a Koppers-Totzek gasifier are shown in Table 2-4; 85-90% carbon conversions were achieved. Quantities of carbon monoxide and hydrogen in the medium-heat value gaseous product were much higher than for the lower temperature Lurgi process. The tar content of the gas was very low. This renders K-T gasification currently suitable for the preparation of synthesis gas. The distribution of trace elements during Koppers-Totzek gasification has not been specifically studied, although, because of the high gasification temperatures, it can be expected that mercury, arsenic, lead, cadmium and selenium, for example, would be vapourized to a large extent during gasification. These elements may be recovered during gas cleaning.

In Finland, peat was gasified with Koppers-Totzek gasifiers

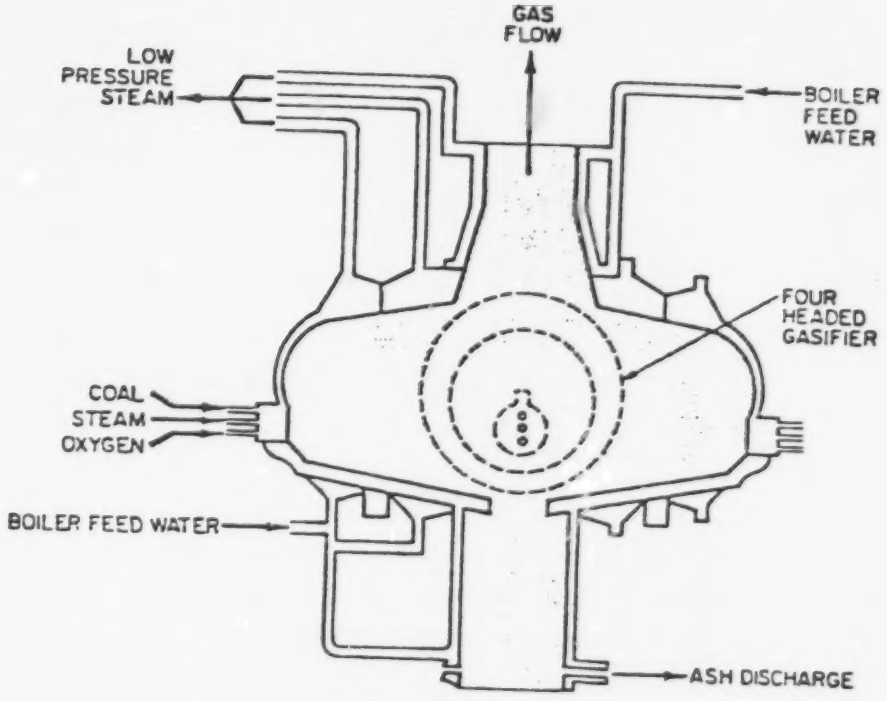


FIGURE 2-2

Koppers-Totzek Gasifier

TABLE 2-4

RESULTS OF TESTS IN A
KOPPERS-TOTZEK GASIFIER

	Test 1	Test 2
Outlet Temperature of Gas, ^{o}C	1200	1090
Consumption/m^3 of CO + H_2		
Peat Dust (drv) kg	0.949	0.931
Oxygen (98.5%), m^3	0.453	0.385
Steam, kg	0.141	0.135
Gas Analysis (dry gas), %		
CO_2	15.8	14.9
O_2	0.2	0.2
CO	45.9	45.8
H_2	32.5	33.4
N_2 + Ar	4.5	4.2
CH_2	1.1	1.5

Source: Leppamaki et al, 1979

by Typpi OY on an industrial scale in the 1960's for ammonia synthesis. The most serious drawbacks found were high oxygen consumption and the extensive requirements for pretreatment, such as drying and milling (8% H_2O, <0.7 mm). Because of the very low density of peat, there was a problem of plugging when feeding the gasifier. The milling operation was also plagued with small dust explosions. Nevertheless, peat can be gasified in this equipment, provided special attention is paid to its handling and feeding to the gasifier.

A consortium of U.S. companies is planning a 614 tonne/day methanol plant to operate on synthesis gas prepared from milled peat by Koppers-Totzek technology (Peat Methanol Associates), while Shell and Krupp-Koppers of Essen, West Germany, are developing a high-pressure version of the process.

.4 Winkler Gasifier

The Winkler gasification process has been used commerically with coal for many years to produce low and medium heat value gas. Currently, six Winkler gasifiers are operational, each producing synthesis gas.

The gasifier is a refactory-lined cylindrical tower equipped with a funnel-shaped bottom. Coal is screw-fed into the bottom section of the gasifier and the larger particles are gasified in a fluidized bed. The smaller particles are carried over with the gas and gasified in the upper zone of the reactor with excess steam and oxygen.

The temperature of the gasification zone ranges from 815° to 1100°C; the pressure is slightly above atmospheric. A thermal efficiency of 75% has been reached with this gasifier.

The high temperatures reached in the upper part of the reactor allow complete cracking of tar and higher hydrocarbons. On the negative side, it is difficult to gasify peat with fluidized bed methods, because of the excessive carry-over of fines in the exhaust gas.

A high-pressure (1.1 MPa) version of the Winkler gasifier is marketed by Uhde. Studsvik Energieteknik is planning pilot experiments with a pressurized version of this gasifier. With pressurized operation, some heat recovery is possible and the treated gas volumes are smaller than at atmospheric pressure.

The Canadian-developed Omnifuel gasifier is a fluid-bed design, currently processing sawdust and woodchips at the rate of 26 GJ/h. The design is said to be suitable for peat gasification, although no data has been made available.

.5 PEATGAS Integrated SNG Production Process

In 1980-82, the U.S. Department of Energy funded a feasibility study to assemble and evaluate the mining, dewatering and gasification technology for the production of 84 TJ/day of energy (as SNG) from peat (Dravo, 1982). The gasification section selected for this study was the PEATGAS process, developed by the Institute of Gas Technology (IGT). This process is one result of an extensive R & D program initiated by the IGT in 1948. Initial effort was directed at coal, and resulted in the development of the HYGAS process, a gasification system that coverts coal to a methane-rich gas for upgrading to substitute natural gas (SNG). The research

program carried-out by IGT, demonstrated that the gas produced using peat as a feedstock in the hydrogasification process, is significantly higher in methane and ethane content than gas produced from coal and lignite. Further, the quality and quantity of liquid fuels produced from peat during the process are equal or superior to those resulting from the gasification of coal or lignite.

The principal elements of the overall PEATGAS process include:

- peat sizing and pre-drying
- final fluidized bed drying (in reactor vessel)
- one-stage hydrogasification (in reactor vessel)
- char gasification (in reactor vessel)
- gas cleaning
- gas desulfurization
- CO-shift reaction
- methanation
- CO_2 removal
- byproduct recovery systems for phenol, sulfur and ammonia

The PEATGAS reactor vessel is shown in Figure 2-3. Peat, containing 30 to 50% moisture, is milled to particles smaller than 2 mm and is fed to the top of the reactor using lockhoppers. Prior to entering the gasification zone, the peat passes through a fluidized-bed dryer which is integral with the reactor vessel and is located on top of it. Here the incoming peat is preheated and dried by the gases leaving the hydrogasifier. The dried peat then flows down a standpipe into the hydrogasification stage where flash pyrolysis takes place in the presence of hot, hydrogen-rich synthesis gas rising through a fluidized bed of reacting peat solids. The gas from the hydrogasifier flows up to the drying stage and the pyrolysed char flows down by gravity to the char gasifier stage where it is reacted with steam and oxygen in a fluidized bed to make synthesis gas. Up to 90% conversion of the feed carbon is achieved in the two stages. The hot ash is discharged from the system and quenched by recirculating

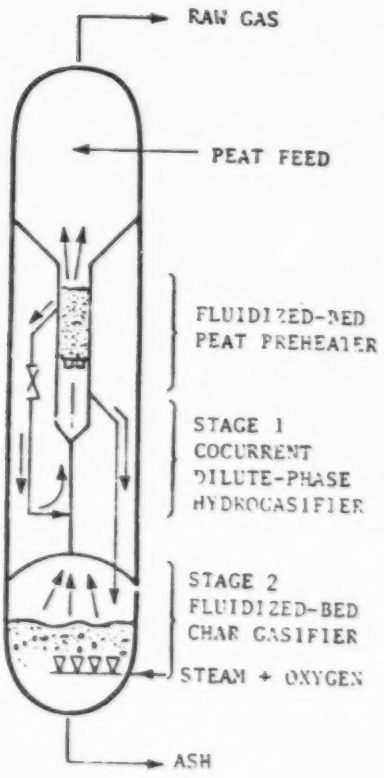


FIGURE 2- 3

PEATGAS REACTOR

water. The resultant ash-water slurry is filtered and the filtrate is recycled.

The product distribution from the PEATGAS reactor can be easily controlled by regulating the temperature in the hydrogasification stage. The effects of temperature and the control alternatives have been described by Punwani and Biljetina (1980). In effect, the PEATGAS Process can be designed to produce one of three primary products: methane (SNG), medium-heat value fuel gas or synthesis gas for further processing into methanol or Fischer-Tropsch products (synthetic gasoline). The first of these options has been the subject of a feasibility study (Dravo, 1982).

The calculated overall thermal efficiency for SNG production from Minnesota peat was 65.92%.

Material balances derived for a feasbility study of gasification by the PEATGAS Process to produce high heat value gas from Minnesota Peat are presented in Table 2-5.

223 LIQUEFACTION TECHNOLOGY

.1 General

At present, there are three principal routes to synthetic liquid fuels from peat, coal or biomass:

- pyrolysis
- catalytic (direct) liquefaction
- indirect liquefaction (via gasification)

TABLE 2-5

PEATGAS REACTOR OUTPUT

Gas	Moles/Hr @ 232°C
CO	3718
CO_2	10882
H_2	6396
H_2O	23879
CH_4	4915
C_2H_4	35
C_2H_6	947
C_3H_6/C_4H_8	10/10
NH_3/HCN	610/24
N_2 & Ar	49
N_2/COS	48/2
C_6H_6	212
C_6H_6O	89
$C_{10}H_8$	8
Particulates: Gasifier Peat 9939 kg/hr.	
Char Residue from PEATGAS Reactor:	% Wt.
C	24.51
H	0.77
N	3.47
S	0.40
O	-
Ash	70.85
Total TPD	669.3

Source: Dravo, 1982

Each of these technologies have been demonstrated using coal as the feedstock. Pyrolysis technology has been practiced commercially for wood, and it is in-place for the production of methanol via gasification. For peat, indirect liquefaction appears to be practical; peat pryolysis and direct liquefaction are at the research stage.

The indirect liquefaction of coal, peat or biomass consists of four principal operations:

- gasification
- gas cleaning and shift reaction
- liquids synthesis (Methanol or Hydrocarbons)
- liquids purification

Gasification processes are considered in Section 222. If liquid products are desired, the gas must be cleaned, compressed and its H_2:CO ratio shifted to suit the requirements of catalytic liquefaction. Such a prepared gas is termed synthesis gas or "Syngas". Commercial processes are available for the production of methanol and other hydrocarbons from Syngas. The treatment of Syngas with the appropriate catalyst will yield a mixture of hydrocarbons and alcohols, the composition of the product mix being dependent on the catalyst employed. These are classified as Fischer-Tropsch syntheses. Two commercial-scale coal liquefaction plants are operating in South Africa at Sasolbury, producing a variety of hydrocarbons, alcohols, ketones and byproducts.

At present, the production of methanol from peat appears to be of most potential. A peat to methanol process is near commericalization by Peat Methanol Associates in the United States (Monenco Ontario Limited, 1981).

The most highly developed technology for producing liquid hydrocarbons from Syngas is the SASOL technology, based on Fischer-Tropsch reactors. This technology was commercially applied in Germany between the

two wars, and is currently operating in South Africa. The starting material is coal and the products include a high-heat value gas, gasoline, diesel oil, waxes and chemicals. Approximately 42% of the feed energy is used to provide power and process steam. 18% of the coal fed to the plant is converted into liquid products. The rest are solid are gaseous products. The plant is commercially successful only because of a very unusual economic situation in South Africa.

An excellent summary of the environmental aspects of a 30,000 tonne/day conceptual coal fed Fischer-Tropsch plant has been given in the report by Loran and O'Hara (1978). The conceptual design incorporates advanced technology, such as high-temperature, high pressure gasification (Bi-Gas principle), and a flame sprayed catalytic reactor, for the Fischer-Tropsch conversion. Both of these are still in a developmental state. The projected overall thermal efficiency of the process, with these advanced features is ∿70%.

The conceptual plant is based on the assumption of an adequate supply of water. The wastewater treatment is therefore a combination of recycling and discharge of aqueous effluents. The most heavily contaminated streams are concentrated by evaporation, with residuals being recycled to the gasifier for combustion. Other less contaminated streams are purified by chemical oxidation and reused. The lightly polluted streams are treated biologically and released.

2.3 WASTE MANAGEMENT

231 SOURCES OF WASTES

The sources of wastes from gasification and liquefaction processes

are well known. However, quantitative data concerning the quantity and composition of wastes for peat conversion processes are scarce and reliance must therefore be placed on information for coal and other biomass conversion systems (Wen and Lee, 1979; Braunstein, 1977; Dearborn, 1983).

The sources of wastes for a coal conversion facility are given in Table 2-6. It can be expected that similar sources would be associated with the use of peat as the feedstock. The approximate quantities of wastes produced from a coal gasification facility are given in Figure 2-4. The quantities of wastes from a peat conversion operation would be expected to be somewhat similar. The use of peat would, however, be expected to produce less sulphur and more ammonia relative to coal due to the relatively lower sulphur content and higher nitrogen content of peat.

The most significant gaseous emission from conversion processes is air from the cooling tower followed by cooling tower moisture, nitrogen from the oxygen plant, carbon dioxide from acid gas removal and flue gas from the utility boiler. Magnitudes of the gaseous emissions in terms of volumes and relative volumes are summarized in Table 2-7.

The most significant potential source of water pollution is the gas liquor produced in the scrubbers during condensation of the gasifier product gas. Gas liquors usually contain contaminants such as oils, tar, hydrogen sulfide, thiophene, phenols, fluorides, fatty acids, ammonia, cyanides, amines, pyridine, thiocyanates, thiosulfates and trace elements. Typical concentrations of some of these materials in gas liquor (sour water) are presented in Table 2-8 together with concentrations after biological oxidation treatment to reduce organic contaminant levels.

Sulfur compounds typically present in coal conversion effluents include elemental sulfur, hydrogen sulfide, sulfur dioxide, carbonyl

TABLE 2-6

POTENTIAL COAL CONVERSION POLLUTANTS

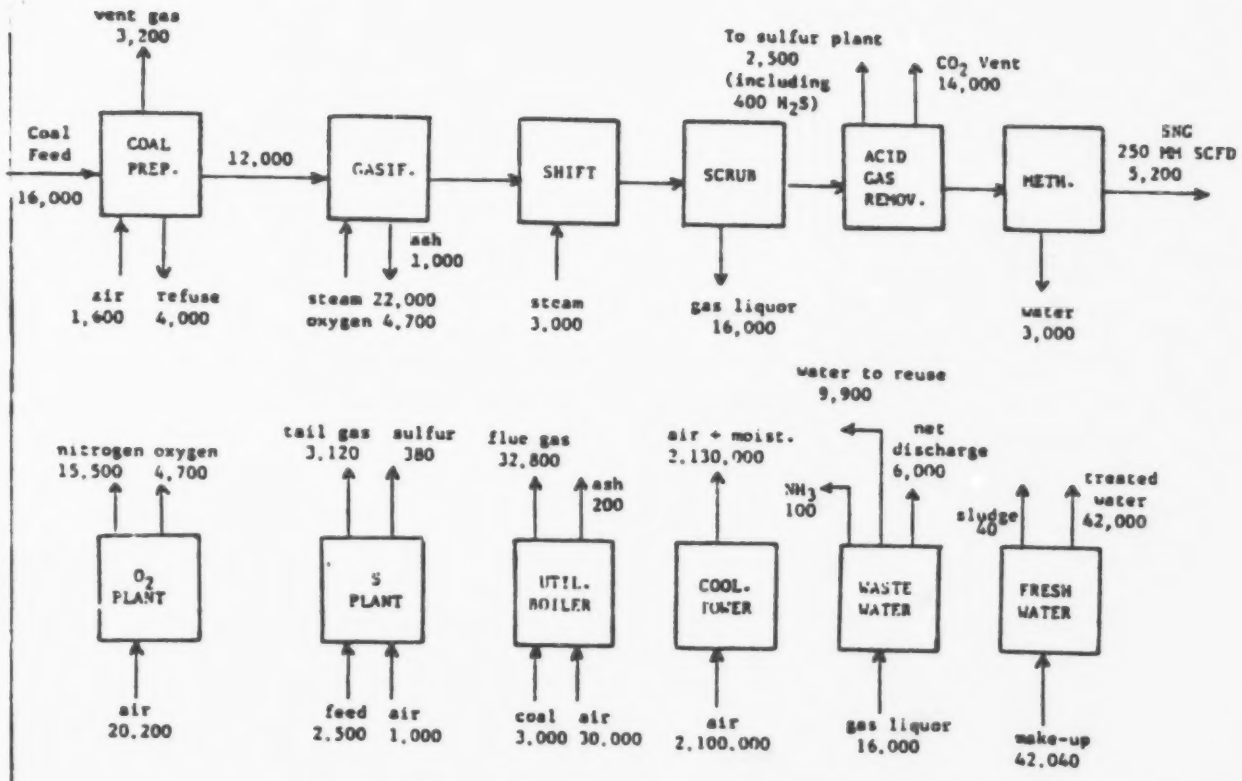
Potential Pollutants	Process Source	Treatment Processes
Runoff Water	Coal Storage	Collection, neutralization, demineralization, ion exchange, settling
Coal-washing aqueous wastes	Coal Processing	Collection, neutralization, demineralization, ion exchange, settling
Coal dusts and fines	Coal Storage and processing	Cycline separators, fabric filters, negative pressure grinders, wet scrubbers, electrostatic precipitators
Mineral debris	Coal Processing	Landfill, minefill
Mineral residues	Water Processing	Landfill, minefill
Water treating chemicals	Water Processing	Landfill, minefill
N_2	Oxygen generation	Venting
Stack gas	Utility and steam Production	Limestone scrubbing, electrostatic precipitators, Wellman-Lord, Cation-Oxidation, MgO scrubbing
H_2S	Conversion	Acid gas scrubbed, Stretford, Giammarco Vetracoke, and Takahax (1-step removal); Amine, Economine, Alkazid, Benfield, Catacarb CO_2 removal, Purisol, Adip, Fluor, Selexol, Rectisol, Sulfinol, SNPA-DEA processes (2-step removal requiring Claus-based sulfur recovery units)
NO_x	Conversion	Venting, Continuous Catalytic Absorption, Modified Alkalized Alumina, equipment design modification
CO_2	Conversion	Stack gas cleanup of sulfur and combustibles, venting
COS, CS_2	Conversion	Recovered in some scrubbing processes for H_2S; fugitive emission from sulfur-recovery unit tail gas
NH_3	Conversion	Stripped by Phosam or Chevron unit for resale recovery; residual NH_3 treated in wastewater
HCN	Conversion	Follows ammonia to wastewater treatment

TABLE 2-6 (Cont'd)

POTENTIAL COAL CONVERSION POLLUTANTS

Potential Pollutants	Process Source	Treatment Processes
Miscellaneous gases (HF, HCl, CO)	Conversion	Wet-scrubbed from product gas stream and transferred to wastewater treatment processes such as biological oxidation ponding or lime neutralization for removal
Volatile trace metals (Hg, As, Se, Sb, Tl)	Conversion	Stack gas cleaning; modified limestone scrubbing, modified Double Alkali, Cation-Oxidation, DAP-Mn (wet) and Chiyoda processes
Trace metals	Conversion	Recovered in ash, tars, chars and wastewater
Ash	Conversion	Electrostatic precipitators, minefill, landfill, possible resale options
Particulate matter	Conversion	Cyclone separators, fabric filters, negative pressure grinders, wet scrubbers, electrostatic precipitators
Char	Conversion	Recycled as gasifier, steam or utility fuels; requires sulfur recovery before or after combustion; wastewater treating potential
Tar	Conversion	Hydrodesulfurized for fuel oil, gasified or combusted, residual treated in wastewater
Oils	Conversion	Hydrosulfurized for fuel oil, residual treated in wastewater
Gaseous hydrocarbons	Conversion	May be scrubbed into wastewater for activated carbon or biological oxidation pond removal
Phenols	Conversion	Stripped by Phenosolvan for recovery and resale; residual removal by active carbon absorption, biological oxidation ponding, or evaporation
Process wastewater	Conversion	NH_3 and phenol stripping (Chevron, Phenosolvan, Phosam), Lime neutralization, active carbon absorption, biological oxidation ponding, residual tar and oil removal, evaporation, zeolite treatment
Spent catalysts	Conversion control treatment	Regeneration, disposal in landfill or minefill
Sulfur recovery tail gas (H_2S,SO_2,CO_2,CS_2)	Control and treatment	Beavon, Cleanair, Chiyoda, IFP (Institut Francais du Petrole) Aquaclaus, SCOT (Shell Claus Offgas Treating), venting, or combustion
Slag	Control treatment generated (limestone processes)	Granulated for landfill, minefill, or resale

Source: Braunstein et al, 1977



Units: t/d unless indicated otherwise

FIGURE 2-4

COAL GASIFICATION

Source: AICHE, 1977

TABLE 2-7

GAS EMISSIONS FROM
COAL GASIFICATION PROCESSES

Stream	Emissions	
	Million Nm^3/d	Relative Volume
Synthetic Natural Gas[a]	7.1	1.0
Coal Dryer Vent Gas	2.8	0.4
CO_2 from Acid Gas Removal	7.8	1.1
N_2 from Oxygen Plant	12	1.7
Claus Plant Tail Gas	2.4	0.3
Flue Gas from Utility Furnace	22	3.1
Air from Cooling Tower	1600	220.0
H_2O Evaporated in Cooling Tower	36	5.1

[a] product of coal conversion

Basis - 11,000 t/d of coal
Source: AICHE, 1977

TABLE 2-8

SOME CONTAMINANTS IN SOUR WATER

Item	Gas Liquor	To Biox	From Biox
	mg/L	mg/L	mg/L
Phenol	2,000- 4,000	100-500	0.1-0.3
Fatty Acids	-	500-1,500	9
Ammonia	8,000-11,000	200-1,000	5-10
Thiocyanates	5-10	1	0.1
Fluoride	-	56	6
BOD	-	2,500	75
COD	10,000-20,000	1,100	82

Biox - biological treatment

Source: AICHE, 1977

sulfide, carbon disulfide, metallic and organic sulfides, mercaptans, thiophenes and thiocyanates. Inorganic sulfide, usually as pyrite, constitutes a large proportion of the total sulfur in coal and can usually be removed (from coal only) by physical processes prior to gasification. During gasification, about 90% of the remaining organic sulfur is converted to hydrogen sulfide, with a few percent of mercaptans and carbonyl sulfide, and trace amounts of other sulfur compounds. These sulfur compounds must be removed from the product gas for both environmental reasons and to prevent poisoning of catalysts if they are used downstream for methane, methanol or Fischer-Tropsch syntheses. Small amounts of sulfur compounds are retained in the gasifier ash, tars and chars. In the ash, the sulfur is expected to be fixed to the stable carbon lattice. Tars contain organic sulfides, mercaptans and thiophenes. Sulfur compounds (hydrogen sulfide, carbonyl sulfide and carbon disulfide) may also be released to the atmosphere as fugitive emissions from a variety of sources.

Nitrogen compounds may be major pollutants during gasification, especially with peat because of the relatively large quantities of nitrogen in peat. Nitrogen oxides are produced during combustion of the gasifier product and in the utility boiler during steam production but are not produced during gasification because of the reducing conditions. Major nitrogen compounds formed in the gasification process are ammonia, cyanides and amines. A limited number of measurements indicate that essentially all of the converted nitrogen is released as NH_3, with a trace amount (<0.5%) of HCN. Technology is available for the recovery of ammonium compounds as a byproduct.

The distribution of trace elements in coal conversion streams is difficult to generalize, because of the number of variables that influence it. Trace element pathways within conversion processes may include adsorbtion on particulate matter, inclusion in condensates,

deposition on surfaces, inclusion in byproducts and emissions as fugitive products.

The volatilization of trace elements during the gasification of coal in a bench scale Hygas gasifier is shown in Table 2-9 (Attari, 1973). Similar volatilization characteristics would be expected for the use of peat as a feedstock.

It should be noted that the fate of trace elements in fuel conversion operations, such as gasification or direct liquefaction, can be very different from that experienced in direct combustion operations. Conversion operations take place in a reducing atmosphere, whereas in combustion the conditions are always oxidizing. Instead of oxides dissolving in the major ash components such as alumina or silica, the reduced metallic compounds (hydrides, carbonyls, sulfides) are more volatile, as well as more reactive and toxic. It has been observed (Lim, 1980) that smaller particles in fly-ash contain higher concentrations of trace elements, presumably due to their volatilization and subsequent condensation upon the fly-ash particles.

In addition to the trace elements originally present in coal or peat, it is also necessary to be concerned with the trace materials formed during processing. The gasifier configuration has significant influences over the quantity and composition of combustible materials in the raw gas. The Lurgi gasifier produces large amounts of tars and hydrocarbons as the hot gases exit through the descending column of fresh feed and subject it to partial pyrolysis. The Koppers-Totzek and Winkler gasifiers produce much less organic byproducts, since the former operates at high temperature and short residence time, and the latter contains an "afterburner" section in the top of the gasifier and the fluid bed materials may have catalytic effects in promoting complete conversion. The trace compounds generated in conversion processes report mainly in the gas quenching and scrubbing

TABLE 2-9

ESTIMATED VOLATILITY OF
TRACE ELEMENTS

	Typical Coal	Volatile[a]	Quantity Volatilized[b]
	ppm	wt%	kg/d
Cl	1,500	90+	15,000
Hg	0.3	90+	2.7
Se	1.7	74	14
As	9.6	65	68
Pb	5.9	63	40
Cd	0.8	62	5.4
Sb	0.2	33	0.9
V	33	30	110
Ni	12	24	31
Be	0.9	18	1.8
Zn	44	e.g. 10	48
B	165	e.g. 10	180
F	85	e.g. 10	93
Cr	15	nil	nil

[a] Volatility based mainly on gasification experiments, but chlorine taken from combustion tests, while zinc, boron, and fluorine taken at 10% for illustration in absence of data.

[b] Estimated amount volatile for 11,000 t/d of coal to gasification.

Source: Attari, 1973

liquors, but they may also be present in the fugitive gaseous streams and in solid waste (sludge and fly-ash) streams. The presence of trace organic compounds in conversion products is important because many are known to be toxic and mutagenic. Mutagenic compounds detected in coal tars include polycyclic aromatic hydrocarbons (PAH), multi-alkylated PAH, primary aromatic amines and N-heterocyclic PAH.

2.4 POLLUTION CONTROL

Processes are available for controlling most of the wastes generated during gasification and liquefaction operations. Treatment processes for coal conversion processes are given in Table 2-6. It can be expected that similar treatment processes would be required for, and applicable to use of peat as a feedstock for gasification and liquefaction. Treatment systems are considered in the following sections with respect to the wastes particular to conversion processes.

241 TAR RECOVERY AND GAS CLEANING

After the raw gas leaves the gasifier, it is cooled in a heat recovery device in preparation for further processing. In low temperature processes, such as the Lurgi gasifier, tar will be present and this product is recovered by first quenching the gas with water until a gas liquor is formed after the raw gas becomes saturated. This liquor is then sent to the process water purfication system, where phenol and ammonia byproducts are recovered. Tar and tar oil byproducts are also removed.

Alternatively, in higher temperature processes, such as the Koppers-Totzek gasifier, there is no significant amount of tar, and the raw gas is water scrubbed to produce a gas liquor. This liquid, which

may contain a substantial amount of the gasifier slag (e.g. 50% in the Koppers-Totzek gasifier) is initially treated in a clarifier to remove the solids which are combined and disposed of along with the slag recovered from the base of the gasifier. The liquid then passes on to the process water purification system.

242 ACID GAS REMOVAL

The acid gas removal system is designed to remove hydrogen sulfide, carbon dioxide and carbonyl sulfide from the gasifier product. Aliphatic hydrocarbons and light oils such as benzene, toluene and xylene are also recovered. Trace levels of mercaptans and organic sulfides may also be present.

Acid gas removal systems may be non-selective in which all the above impurities are removed simultaneously or selective, in which the hydrocarbons, sulfides and carbon monoxide are removed selectively. The choice usually depends on the quantities of impurities present and on the equipment to be used for sulfur recovery.

The major pollutant from the acid gas removal system is the purge stream, which removes particulate material and degradation products from the stripping solutions. Both the amine and hot carbonate processes require purging and in addition to these compounds in the purge stream, catalysts may also be present. For example, arsenic trioxide is used as a catalyst in the Giammarco-Vetrocoke carbonate processes. In addition, catalyst from the shift conversion section, or trace metals vaporized during gasification, may also be present. Usually, the purge stream is disposed of by incineration but the likely presence of trace metals is a potential source of environmental pollution.

243 SULFUR RECOVERY

The hydrogen sulfide stream originating from the acid gas purification system is treated to remove the sulfur before the remainder of the stream is recycled to the gasification system.

Usually, a saleable elemental sulfur product is generated using either a Claus plant or a Stretford plant. The latter is generally used when the hydrogen sulfide concentration is less than 10%. It might be expected that a Stretford plant would be the most appropriate during peat gasification because of the low sulfur content of peat.

Recovery of sulfur in the Stretford plant is at least 94%. The H_2S stream entering the plant is treated with an aqueous solution of sodium carbonate, sodium vanadate, anthraquinone disulfuric acid (ADA), citric acid and chelated iron, at 80°F and a pH of 8.5. The vanadium, which oxidizes the hydrozen sulfide to elemental sulfur, is reduced and is then re-oxidized by the ADA to the pentavalent state. Sulfur is then recovered from a froth by filtration, centrifugation and flotation. A purge solution containing dissolved solids is removed from the process continually to maintain the quality of the oxidizing solution. Disposal procedures must be provided for the purge stream which contains:

- sodium anthraquinone disulfonate
- sodium metavanadate
- sodium citrate
- sodium thiosulfate
- sodium thiocyanate

The thiocyanate and thiosulfate predominate; the thiocyanate originating from hydrogen cyanide remaining in the acid gas after the previous treatment stages. Sometimes, cyanide is removed in a separate process before the Stretford plant.

Usually, large amounts of sulfur are present in the Stretford plant gaseous effluent, including hydrogen sulfide and carbonyl sulfide, which is not removed in the Stretford process. Most of the stream, however, is carbon dioxide.

Claus plants are more commonly used to remove sulfur in coal gasification processes. This process is also highly efficient and recoveries of 97% sulfur or more have been reported. Again, as in the Stretford process, it is normal to also have additional facilities to clean up the tail gas from the Claus plant.

244 SULFUR PLANT TAIL GAS TREATMENT

Usually the sulfur plant tail gas undergoes further treatment before emission to the atmosphere. The tail gas may contain hydrogen sulfide and carbonyl sulfide from the Stretford process.

Tail gas treatment usually involves incineration with product gas from the gasification section. A typical analysis of the incineration flue gas for a Lurgi coal gasification effluent treated by a Stretford plant is as follows:

Component	Volume
CO_2	62.5%
N_2	29.8%
H_2O	7.4%
O_2	0.3%
SO_2	295 ppm
COS	77 ppm
NO_x	58 ppm

Alternatively, it may be possible to lower the sulfur dioxide level by using a flue gas desulfurisation process instead. This would likely produce a solid effluent such as gypsum or sodium sulfate depending on the process selected.

245 EFFLUENTS FROM SHIFT CONVERSION

The next stage in treating the gasifier product is a shift conversion, which is included if a higher heat value gas product or a liquid product is required.

No pollutants are created during shift conversion, since the process essentially involves adding steam to a portion of the gasifier product to oxidize carbon monoxide to carbon dioxide, and reduce the steam to hydrogen so that the required overall hydrogen to carbon monoxide ratio for the later methanation stage is obtained. However, catalyst from the shift conversion process, for example cobalt-molybdenum, may be unintentionally lost and eventually appear in the final product or in the wastewater stream. It appears that in some plants, losses of catalyst can amount to several hundred kilograms per year.

246 VENT GASES

Airborne emissions from a conversion plant originate mainly from the following four sources:

- sulfur plant tail gas incineration
- oxygen plant emissions
- steam and power plant flue gases
- coal or peat dryer vent gases

The first source has already been discussed, whereas the second source will emit only nitrogen and traces of other components of ambient air.

Flue gases from the steam plant will contain carbon dioxide, nitrogen, oxygen and moisture. Major contaminants will be nitrogen oxides and sulfur dioxide, depending on the sulfur content of the fuel.

Several processes, including ammonia injection and catalytic reduction, have been developed recently and these will remove as much as 90% nitrogen oxides from flue gases if installed.

The coal (or peat) dryer vent gases will contain the same components as the steam plant flue gases, except that nitrogen oxides will not be present and sulfur dioxide will be a minor component.

247 WASTEWATER PROCESSING

Wastewaters generated in a gasification plant from operations such as quenching, scrubbing and gasification, contain large quantities of contaminants which must be removed before the water can be disposed of or recycled. The composition of a typical coal conversion stream is presented in Table 2-10. Because of the variation in the type of pollutants present, a complex water treatment system, such as that shown in Figure 2-5, may be required. Usually, the water is recycled after cleaning and theoretically the only process water lost is through sludges derived from various processes in the plant such as ash disposal, biological oxidation, and water softening.

248 COOLING WATER LOSSES

Large amounts of water are required in a gasification facility

TABLE 2-10

COMPOSITION OF A TYPICAL COAL CONVERSION WASTEWATER

Component	Concentration in Wastewater
	$\mu g/m^3$
Phenol	6,000
NH_2	10,000
H_2S	1,000
CN	100
SCN	500
PAH	10
TOC	20,000

Source: Braunstein, 1977

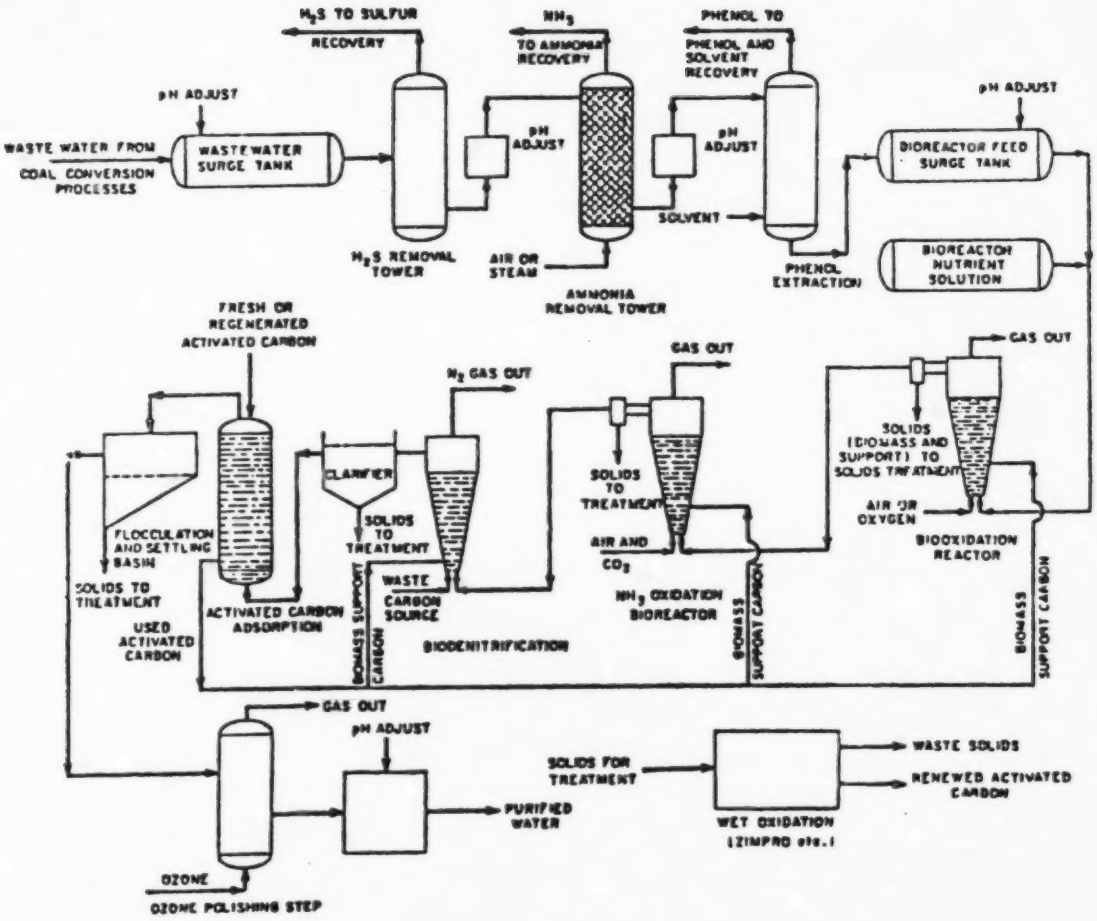


FIGURE 2-5

COAL GASIFICATION PLANT

WASTEWATER TREATMENT SYSTEM

Source: U. Calif., 1980

for cooling. Cooling towers are normally used. Water from the cooling tower can be lost to the atmosphere by drifting. Ice problems may result from drifting in winter and the drift may also include the following additional pollutants:

- particulate material present as water hardness if there is no treatment system
- chlorine used as an algicide
- corrosion inhibitors, generally chromates but also zinc salts and inorganic phosphates
- process water impurities, including organics and trace metals which enter the cooling water through leakages
- scale control agents such as phosphate esters.

The release of pollutants from the cooling tower could be alleviated through the use of finned air-cooled heat exchangers but costs would be increased considerably.

249 PHENOL RECOVERY

Phenol is recovered from the wastewater using organic stripping. The phenol solvent mixture is collected and fed to solvent distillation columns, where crude phenol byproduct is recovered. Solvent is recycled after water removal. The crude phenol is stripped with fuel gas to remove traces of solvent absorbed in the extraction step. Finally, the crude phenol is heat and steam stripped producing an effluent containing carbon dioxide, hydrogen sulfide and ammonia. The effluent is treated in a deacidifier reboiler, where the carbon dioxide and hydrogen sulfide vapour is compressed and sent to the sulfur recovery plant. Ammonia is collected in an aqueous solution and sent to the ammonia stripper.

250 ASH DISPOSAL

Ash from the gasifier is usually dewatered and disposed of along with sludges derived from various other steps in the gasification process. The ash is normally disposed of as landfill. Leaching of the ash may pose a pollution potential similar to those for peat combustion ash (Section 132.6).

REFERENCES

AIChE. 1977. Coal Processing Technology. Volume 3.

Attari, A. 1973. The Fate of Trace Constituents of Coal During Gasification. EPA-G50/2-73-004.

Braunstein, H.M. et al. 1977. Environmental Health and Control Aspects of Coal Conversion. An Information Overview. Oak Ridge National Laboratory.

Dearborn, 1983. Environmental Implications of Coal Gasification/ Liquefation Technologies in Canada. Prepared by Dearborn Consulting Services for Water Pollution Control Directorate, Environment Canada.

Dravo, 1982. "Feasibility Study for Minnesota Gas Company, High BTU Gas from Peat". Proposed by Dravo Engineers and Contractors.

Leppamaki, E., D. Asplund and E. Ekman. 1979. Gasification of Peat - A Literature Review from Proceedings of the Management Assessment of Peat as an Energy Resource. IGT.

Lim, M.Y. 1980. Trace Elements from Coal Combustion - Atmospheric Emissions. NTIS 80-11180.

Loran, B.I. and J.B. O'Hara. 1978. A Clean Coal Conversion Technology, EST 12(12). Nov 1978.

Monenco Ontario Limited. 1981. "Evaluation of the Potential of Peat in Ontario". OME Occasional Paper 7, 1981.

Punwani, D.V. 1980. Peat as an Energy Alternative, An Overview. IGT.

Punwani, D.V. and R. Biljetina. 1980. PEATGAS Process Development States. IGT Peat Converence, Arlington, VA. 1980.

Soulantausta, Y. and D. Asplund. 1980. Methanol from Peat. Technical and Economic Aspects in Finland. IGT.

University of California. 1980. Processing Weeds and Methodology for Wastewaters from the Conversion of Coal, Oil Shale and Biomass to Synfuels. Prepared by University of California for U.S.D.O.E., EV-0081, 1980.

When, C.Y. and E.S. Lee. 1979. Coal Conversion Technology. Addison-Wesley Publishing Company, Inc.

APPENDIX 1

APPENDIX I

FUEL CHARACTERISTICS

(From inhouse data and various
sources of published information)

TABLE AI-1

Comparative Fuel Values of Fuel Oil, Coal, Lignite, Wood and Peat*

Proximate Analysis

Type of Fuel	Location	Proximate Analysis (Dry Basis)			As Received Moisture
		F.C.	V.M.	Ash	
Natural Gas		—	—	—	
Fuel Oil		—	—	—	0.2%
Anthracite	Pennsylvania	84	6	10	3%
Bituminous Coal	Nova Scotia	57	32	11	6%
Sub-Bituminous Coal	Alberta	45-55	25-35	12-18	18 - 28.5%
Lignite	Saskatchewan	45	40	16	
Wood		24	70-74	2-4	50 - 60%
Peat	USSR				50 - 60%
	Finland		68		50 - 60%
	Ireland	30	66.7	3.3	55%
	Sweden				
Canada	Newfoundland				55%
	New Brunswick	25.8	71.8	2.9	50%
	Ontario				50%
	Quebec	26	71	31	62%
	Saskatchewan				
U.S.A.	Minnesota	24	60.5	15.5	40%
	N. Carolina	30.8	63.7	5.5	42%

* From Monenco 'Inhouse' data and various sources of published literature.

TABLE AI-2

Comparative Fuel Values of Fuel Oil, Coal, Lignite, Wood and Peat

Ultimate Analysis

Type of Fuel	Location	Ultimate Analysis					
		C	H	N	S	O	Ash
Natural Gas							
Fuel Oil		85.5	11.2	0.3	0.5 - 6.3	0.4	0.1
Anthracite	Pennsylvania	84	2.4	0.8	0.5 - 4.5	2.0	10.0
Bituminous Coal	Nova Scotia	77	5.0	1.0	3 - 6	1.7	11
Sub-Bituminous Coal	Alberta	60.0	4.2	1.3	0.5	14.5	19.5
Lignite	Saskatchewan	58.0	4.5	1.0	1.1	19.4	16.0
Wood		50	5.8	0.2	0.1	41.4	2.5
Peat	USSR						
	Finland	55.6	5.7	1.2 - 2.8	0.2	32.1	1.5 - 7.2
	Ireland	57.5	5.4	1.5	0.3	32.0	3.3 (1 - 5%)
	Sweden						
Canada	Newfoundland						
	New Brunswick	54.5	5.1	0.8	0.13	36.8	2.4
	Ontario				0.1 - 0.5		0.8 - 3.0
	Quebec	54.5	5.1	0.8	0.13	36.37	3
	Saskatchewan						
U.S.A.	Minnesota	49.3	5.1	2.4	0.2	21.5	15.5
	N. Carolina	58.0	4.0	1.4	0.2	30.0	5.5

TABLE AI-3

Comparative Fuel Values of Fuel Oil, Coal, Lignite, Wood and Peat

Physical Properties

Type of Fuel	Location	Bulk Density* kg/m^3	Ash Fushion Temperature (t_1) Softening °C	Grindability	Heating Value (Dry Basis) Btu/lb	MJ/kg	Remarks
Natural Gas							
Fuel Oil			800 - 1400	—	18,500	43.0	
Anthracite	Pennsylvania	880 - 960	1200	31 - 50	13,730	31.94	
Bituminous Coal	Nova Scotia	680 - 960	1037 - 1125	65	13,360	31.00	
Sub-Bituminous Coal	Alberta	640 - 880	1260	31 - 50	10,140	23.6	
Lignite	Saskatchewan	640 - 720	1080 - 1335	35 - 60	9,150	21.28	
Wood		300 - 320	1400	—	8,620	20.0	Dry Basis
Peat	USSR	250 - 400					
	Finland	250 - 400	800 - 1130	60	9,050	21	Dry Basis
	Ireland	250 - 400	1100	65			Dry Basis
	Sweden	250 - 400	1100		9,500	22	Dry Basis
Canada	Newfoundland	250 - 400					
	New Brunswick	250 - 400	1100		9,100	21.2	Dry Basis
	Ontario	250 - 400	1100				
	Quebec	250 - 400	1100		9,100*	22.2	Dry Basis
	Saskatchewan	250 - 400					
U.S.A.	Minnesota	250 - 400	1150		8.481	19.7	Dry Basis
	N. Carolina	250 - 400	1170	58 - 83	10,150	23.6	Dry Basis

* The range of bulk density given for peat is at moisture content of 50%.

TABLE AI-4

Comparative Fuel Values of Fuel Oil, Coal, Lignite, Wood and Peat

Ash Composition

Type of Fuel	Location	Ash Composition												
		SiO_2	Al_2O_3	Fe_2O_3	TiO_2	P_2O_5	CaO	MgO	Na_2O	K_2O	SO_3	MnO	Cl	N_i	Na
Natural Gas														3-60	1-480
Fuel Oil															
Anthracite	Pennsylvania	60	30	4.0	1.6	—	0.6	0.6	0.5	1.5	0.2	—	—		
Bituminous Coal	Nova Scotia	36-54	19-27	6-33	0.8	0.1	3-4.6	0.6-1.4	1.3	1.8-2.6	2.8-3.6	0.04-0.2	—		
Sub-Bituminous Coal	Alberta														
Lignite	Saskatchewan	23-41	15-28	5-7.5	1.1	—	26.5	5.0	4.2	1.3	—	—	—		
Wood		33.8	2.6	1.6	0.2	—	56.5	4.7	0.5	0.1	—	—	—		
Peat	USSR														
	Finland	40-75	1-16	4-7	0.5-1	2-4	1.5-12	0.5-2.5	—	0.1-0.5	—	—	—		
	Ireland	20.1	2.7	11.7	0.6	1.91	47.3	8.8	1.0	5.7		0.4			
	Sweden														
Canada	Newfoundland														
	New Brunswick														
	Ontario	7.9-38.8	3.3-22.3	2.4-11.6	—	0-2.6	1.3-42.7	4.4-5.3		0.4-2.8		0.2	—	—	—
	Quebec														
	Saskatchewan														
U.S.A.	Minnesota	62.2	12.5	8.4	0.6	0.8	6.5	2.0	0.9	2.0	3.5	—	—		
	N. Carolina	43.8	9.1	4.9	0.8	1.8	33.2	4.1	1.1	1.2	—	—	—		

TABLE AI-5

Comparative Fuel Values of Fuel Oil, Coal, Lignite, Wood and Peat

Trace Metals

Type of Fuel	Location	Trace Elements in ppm																						
		Br	B	Be	Bo	Cr	Co	Cu	Cd	Ger	Man	Mo	Mg	K/Na	Pb	Ni	St	Sn (tin)	V	Zn	Ga	Tl	La	Y	Hg
Natural Gas																									
Fuel Oil																									
Anthracite	Pennsylvania																		25–600						
				SIMILAR TO BITUMINOUS COALS OF NOVA SCOTIA																					
Bituminous Coal	Nova Scotia	33–270	2–257	1–2	6–25	9–18	3–34	10–18	0.2–2	1–8	9–254	2–12	—	—	16–32	6–74	76–87	1	7–28	13–250	—	—	—	—	0.2
Sub-Bituminous Coal	Alberta																								
Lignite	Saskatchewan		116	1.5	—	7	2.7	15		1.6		1.7				7.2		0.9	16	59	5.5	591	9.5		
Wood																									
Peat	USSR																								
	Finland		—	—	—	—	21	1	42	—	—	—	—	—	16	5	30	—	—	34	—	—	—	—	—
	Ireland																								
	Sweden																								
	Canada Newfoundland																								
	New Brunswick																								
	Ontario	—	—	—	—	3	—	6	1	—	—	—	—	—	16	—	—	—	—	31	—	—	—	—	0.06–4
	Quebec																								
	Saskatchewan																								
	U.S.A. Minnesota				1.44				.62			17.9	1.16	6.5											
	N. Carolina																								

TABLE AI-6

Comparative Fuel Values of Fuel Oil, Coal, Lignite, Wood and Peat

Combustion Data

Type of Fuel	Location	Excess Air For Combustion	Boiler Efficiency %	SO_2 lb/10^6 Btu Heat Input	NO_x ppm	CO_2% By Volume in dry Flue Gas at 0% Excess Air
Natural Gas		5 - 10	80 - 88	—	300 - 600	11.6 - 12.7
Fuel Oil		3 - 7	80 - 90	2.7 (based on 2.5% sulphur oil)	300 - 600	14.2 - 16.4
Anthracite	Pennsylvania	18 - 25	70 - 85	4.37 (based on 3% sulphur in coal)	300 - 600	19.3 - 19.9
Bituminous Coal	Nova Scotia	18 - 25	70 - 85	4.5 (based on 3% sulphur in coal)	300 - 600	17 - 19.5
Sub-Bituminous Coal	Alberta	18 - 25	70 - 84	1.0	300 - 600	17 - 19.5
		18 - 25		2.4	300 - 600	17 - 19.5
Lignite	Saskatchewan	20 - 30	70 - 82			17 - 20
Wood		20 - 30	66 - 80	0.23	200 - 300	18 - 20
Peat	USSR	25 - 50	64 - 80			17 - 20
	Finland	25 - 50	64 - 80	—	(anticipated)	17 - 20
	Ireland	25 - 50	64 - 80	0.44	300 ppm or less	17 - 20
	Sweden	25 - 50	64 - 80	0.63	300 ppm or less	17 - 20
Canada	Newfoundland	25 - 50	64 - 80		300 ppm or less	17 - 20
	New Brunswick	25 - 50	64 - 80	0.29	300 ppm or less	17 - 20
	Ontario	25 - 50	64 - 80		300 ppm or less	17 - 20
	Quebec	25 - 50	64 - 80	0.29	300 ppm or less	17 - 20
	Saskatchewan	25 - 50	64 - 80		300 ppm or less	17 - 20
U.S.A.	Minnesota	25 - 50	64 - 80		300 ppm or less	17 - 20
	N. Carolina	25 - 50	64 - 80	276	300 ppm or less	17 - 20

LITERATURE SEARCH

GENERAL BIBLIOGRAPHY Re:
COMBUSTION, GASIFICATION AND
LIQUEFACTION OF PEAT
CA SEARCH DATA BASE 1967 - AUGUST 1983
NTIS DATA BASE 1964 - FEBRUARY 1983

August 1983

Monenco Limited
500 Beaverbrook Court
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E3B 5X4

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500 BEAVERBROOK COURT
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29 August 1983

DSS 7987-3

Ms. S. Day
Environment Canada
5th Floor, Queen Square
45 Alderney Drive
Dartmouth, Nova Scotia
B2Y 2N6

Dear Ms. Day:

Re: Bibliography for Pollution Potential of
Peat Processes (Contract No. KE145-3-0301)

We are pleased to submit this bibliography re the combustion, gasification and liquefaction of peat. The bibliography consists of the results of a Chemical Abstract literature search for the period 1967 to August 1983 and NTIS literature search for the period 1964 to February 1983. A title index system has been provided under the headings of Combustion, Gasification, Liquefaction, and Environmental.

Keywords for the searches were:

Peat - Combustion
Peat - Liquefaction
Peat - Liquefied
Peat - Gasification

These keywords proved to be the most effective as regards all aspects related to the technologies and pollution potential of peat processes.

Yours very truly,

Keith D. Phinney

K.D. Phinney, P.Eng.
Project Manager

INDEX TO TITLES

SUBJECT	TITLE NUMBER
Combustion of Peat	1, 3, 4, 5, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 19, 20, 21, 22, 23, 24, 25, 26, 28, 29, 30, 31, 32, 34, 36, 38, 39, 40, 43, 44, 45, 47, 48, 49, 50, 51, 52, 53, 55, 57, 58, 60, 63, 65, 67, 68, 74, 86, 88, 91, 92, 94, 97, 98, 102, 105, 106, 111, 113, 115, 116, 129, 134, 136, 142, 144, 146, 147, 148, 160, 162, 163, 167, 176, 183, 186, 187, 191, 208, 215, 216, 218, 222, 224, 225, 230, 242, 244, 245, 247, 250, 256, 259, 260, 263, 264, 267, 269, 271, 274, 278, 279, 288, 291, 292, 296, 299, 300
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Environmental Aspects of Peat Combustion, Liquefaction and Gasification	50, 54, 81, 118, 149, 153, 161, 164, 217, 252, 258, 297

1. 66071807 CA: 66(16)71807s JOURNAL
Solid, liquid, and gaseous fuels. I. Fuel characteristics and combustion process
AUTHOR: Kamotskii, I. V.
JOURNAL: Uch. Zap., Leningr. Gos. Pedagog. Inst. im. A. I. Gertsena DATE: 1966 VOLUME: 312, PAGES: 162-91
CODEN: ULPGAI LANGUAGE: Russian

2. 66020911 CA: 66(6)20911p JOURNAL
Reactivity of coal and its influence on the consumption of O during pressure gasification
AUTHOR: Romovacek, Jiri; Malinsky, Jan
JOURNAL: Paliva DATE: 1966 VOLUME: 46 NUMBER: 10
PAGES: 363-7 CODEN: PALIA8 LANGUAGE: Czech

3. 74033300 CA: 74(8)33300d JOURNAL
Exergy of organic fuels
AUTHOR: Zakharov, N. D.
LOCATION: Odess. Mekhnol. Inst. im. Lomonosova, Odessa, USSR
JOURNAL: Izv. Vyssh. Ucheb. Zaved., Energ. DATE: 1970 VOLUME: 13 NUMBER: 9 PAGES: 63-7 CODEN: IVZEAY LANGUAGE: Russian

4. 73100839 CA: 73(20)100839f JOURNAL
Complex power engineering utilization of peat and natural gas
AUTHOR: Atoyan, E. M.; Kashirskii, V. G.
LOCATION: USSR
JOURNAL: Optimizatsiya Parametrov Ratsion. Ispol'z. Topl. Energoustanovkakh DATE: 1969 PAGES: 106-8 CODEN: DBMMYC LANGUAGE: Russian CITATION: Ref. Zh., Teploenerg. 1970, Abstr. No. 3T30

5. 71115013 CA: 71(24)115013q JOURNAL
Selection of the parameters for the automatic control of combustion and drying processes at a peat briquet plant equipped with a mill-vertical drier unit
AUTHOR: Sadovnichii, V. V.; Aleshin, A. P.; Markov, V. P.
LOCATION: USSR
JOURNAL: Tr., Kalinin. Politekh. Inst. DATE: 1968 VOLUME: No. 2, PAGES: 120-9 CODEN: TRKPBI LANGUAGE: Russian

6. 71072753 CA: 71(16)72753m JOURNAL
Correlations between properties of peats
AUTHOR: Volarovich, M. P.; Kopenkin, V. D.; Korol, N. T.; Lishtvan, I. I.; Churaev, N. V.
LOCATION: USSR
JOURNAL: Tr., Kalinin. Politekh. Inst. DATE: 1968 VOLUME: No. 2, PAGES: 224-30 CODEN: TRKPBI LANGUAGE: Russian

7. 69079102 CA: 69(20)79102r JOURNAL
Nomograph for determination of the theoretical temperature of solid fuel combustion
AUTHOR: Sal'kov, P. G.
LOCATION: Vses. Teplotekh. Inst., Moscow, USSR
JOURNAL: Teploenergetika DATE: 1968 VOLUME: 15 NUMBER: 8 PAGES: 90-1 CODEN: TPLOA5 LANGUAGE: Russian

8. 69037764 CA: 69(10)37764c JOURNAL
Table of thermal values for peat fuel
AUTHOR: Karakin, F. F.; Razumov, I. V.
LOCATION: Ivanov. Torf. Trest, Ivanovo, USSR
JOURNAL: Torf. Prom. DATE: 1968 VOLUME: 45 NUMBER: 3 PAGES: 7-8 CODEN: TORPAV LANGUAGE: Russian

9. 69011996 CA: 69(4)11996e PATENT
Carbonaceous solid fuel havig improved combustion properties
INVENTOR(AUTHOR): Wilkinson, Herbert C.; Blayden, Herbert E.
ASSIGNEE: British Coke Research Assoc.
PATENT: Britain; GB 1069288 DATE: 670517
APPLICATION: Britain DATE: 640826
PAGES: 9 pp. CODEN: BRXXAA CLASS: C 10l

10. 67034727 CA: 67(8)34727r JOURNAL
Kinetics of volatile yield in combustion of natural solid fuel
AUTHOR: Finaev, Yu. A.
JOURNAL: Dokl. Akad. Nauk Az. SSR DATE: 1967 VOLUME: 11 NUMBER: 2 PAGES: 126-8 CODEN: DAZRA7 LANGUAGE. Russian

11. 67023845 CA: 67(6)23845b CONFERENCE PROCEEDING
Conbustion characteristics of natural solid fuels
AUTHOR: Kocherezhko, A. N.
JOURNAL: Fiz. Goreniya DATE: 1966 PAGES: 30-6 CODEN: 19IRA5 LANGUAGE: Russian

12. 67013644 CA: 67(4)13644w JOURNAL
Some combustion problems of natural solid fuels having high volatile yield
AUTHOR: Finaev, Yu. A.; Kantorovich, B. V.
LOCATION: Inst. Heat Mass Transfer, Acad. Sci. Beloruss, S.S.R., Minsk, USSR
JOURNAL: Vestsi Akad. Navuk BSSR, Ser. Fiz.-Tekh. Navuk DATE: 1967 NUMBER: 1 PAGES: 125-8 CODEN: VABFAF LANGUAGE: Russian

13. 77155909 CA: 77(24)155909s JOURNAL
High-temperature phase transitions in the fly ash of a thermal electric power plant during production of ash gravel
AUTHOR: Panin, A. S.; Kotel'nikov, D. D.; Zaikina, A. S.
LOCATION: USSR
JOURNAL: Sb. Tr., Vses. Nauch.-Issled. Proekt. Inst. "Teploproekt." DATE: 1970 VOLUME: No. 11, PAGES: 70-90 CODEN: DBMMYC LANGUAGE: Russian CITATION: Ref. Zh., Khim. 1971, Abstr. No. 23M313

14. 77127394 CA: 77(20)127394b JOURNAL
Effect of the heat treatment of peat on the sorption of gases
AUTHOR: Bel'kevich, P. I.; Zuev, T. T.; Letsko, A. P.
LOCATION: Inst. Torfa, Minsk, USSR
JOURNAL: Vestsi Akad. Navuk Belarus. SSR, Ser. Khim. Navuk DATE: 1972 NUMBER: 4 PAGES: 46-9 CODEN: VBSKAK LANGUAGE: Russian

15. 76143276 CA: 76(24)143276z JOURNAL
Formation of carbonates in the mineral part of solid residues during the combustion of lignites and peat
AUTHOR: Baryshev, V. I.
LOCATION: Beloruss. Fil., Energ. Inst. im. Krzhizhanovskogo, Minsk, USSR
JOURNAL: Elek. Sta. DATE: 1972 NUMBER: 3 PAGES: 31-4 CODEN: EKSTAP LANGUAGE: Russian

16. 76049414 CA. 76(10)49414w JOURNAL
Fundamental composition of "fuel" discharges from chamber furnaces of power plants
AUTHOR: Baryshev, V. I.
LOCATION: Belorusenergonaladka, USSR
JOURNAL: Khim. Tverd. Topl. DATE: 1971 NUMBER: 6 PAGES: 128-32 CODEN: KTVTAX LANGUAGE: Russian

17. 76036054 CA: 76(8)36054d JOURNAL
Transformations of the combustible mass of humus fuels during their burning out
AUTHOR: Belosel'skii, B. S.; Baryshev, V. I.
LOCATION: Mosk. Energ. Inst., Moscow, USSR
JOURNAL: Teploenergetika DATE: 1971 VOLUME: 18 NUMBER: 9 PAGES: 42-6 CODEN: TPLOA5 LANGUAGE: Russian

18. 82075385 CA: 82(12)75385f JOURNAL
Change in the elemental composition of humic coals during coalification
AUTHOR: Baryshev, V. I.
LOCATION: Beloruss. Fil., Energ. Inst., USSR
JOURNAL: Khim. Tverd. Topl. DATE: 1974 NUMBER: 5 PAGES: 47-52 CODEN: KTVTAX LANGUAGE: Russian

19. 82056486 CA: 82(9)56486y JOURNAL
Comparison of the methods of peat soil combustion and determination of total copper, zinc, manganese, molybdenum, and iron from one sample
AUTHOR: Sapek, Barbara
LOCATION: Inst. Melior. Uzytkow Zielonych, Falenty, Pol.
JOURNAL: Rocz. Glebozn. DATE: 1974 VOLUME: 25 NUMBER: 2 PAGES: 263-73 CODEN: ROGLAA LANGUAGE: Polish

20. 81066028 CA: 81(12)66028u JOURNAL
Approximation of the functional dependence of the heat capacity of peat combustion products on some variable factors
AUTHOR: Opman, Ya. S.; Venzel, E. F.
LOCATION: Inst. "Belgiprotorf", USSR
JOURNAL: Izv. Vyssh. Ucheb. Zaved., Energ. DATE: 1974 VOLUME: 17 NUMBER: 1 PAGES: 145-7 CODEN: IVZEAY LANGUAGE: Russian

21. 80029054 CA: 80(6)29054h JOURNAL
Anticorrosion properties of ash during the cocombustion of peat and mazut
AUTHOR: Apanovich, A. A.; Baryshev, V. I.; Stolov, M. A.
LOCATION: Beloruss. "Energonaladka", USSR
JOURNAL: Elek. Sta. DATE: 1973 NUMBER: 9 PAGES: 30-2 CODEN: EKSTAP LANGUAGE: Russian

22. 80005600 CA: 80(2)5600g JOURNAL
Combustion of petrographically differing proportions of brown coal
AUTHOR: Zembrzuski, Mieczyslaw; Karcz, Henryk
LOCATION: Tch. Univ. Wroclaw, Wroclaw, Pol.
JOURNAL: Energietechnik DATE: 1973 VOLUME: 23 NUMBER: 6 PAGES: 258-61 CODEN: ETNKA2 LANGUAGE: German

23. 79095170 CA: 79(16)95170y JOURNAL
Principles of the reaction of an iron oxide with aromatic hydrocarbons products of heat decomposition of solid fuels
AUTHOR: Korzin, V. V.; Zhirnova, V. M.; Lishtvan, I. I.; Ogurtsov, A. V.
LOCATION: USSR
JOURNAL: Zh. Prikl. Khim. (Leningrad) DATE: 1973 VOLUME: 46 NUMBER: 5 PAGES: 1058-62 CODEN: ZPKHAB LANGUAGE: Russian

24. 79021410 CA: 79(4)21410e JOURNAL
Combustion of milled peat
AUTHOR: Blagovo, N. V.; Paperno, S. I.; Rubin, M. M.; Stolov, M. A.
LOCATION: USSR
JOURNAL: Teploenerg. Respub. Mezhvedom. Sb. DATE: 1972 VOLUME: No. 2, PAGES: 16-25 CODEN: D8MMYC LANGUAGE: Russian CITATION: Ref. Zh., Teploenerg. 1972, Abstr. No. 11R47

25. 78149569 CA: 78(24)149569k JOURNAL
Simplified methods for calculating the theoretical temperature of combustion
AUTHOR: Egorov, V. E.
LOCATION: "Kurskenergo", Kursk, USSR
JOURNAL: Teploenergetika DATE: 1973 NUMBER: 1 PAGES: 89-93 CODEN: TPLOA5 LANGUAGE: Russian

26. 78088321 CA: 78(14)88321z CONFERENCE PROCEEDING
Thermal decomposition of solid fuels distinguished by a high yield of volatiles
AUTHOR: Vitin, B. N.; Finyagin, A. P.
LOCATION: USSR
JOURNAL: Nov. Metody Szhiganiya Topl. Vop. Teor. Goreniya EDITOR: Kantorovich, B. V (Ed) DATE: 1972 PAGES: 88-98 CODEN: 26BZAI LANGUAGE: Russian PUBLISHER: "Nauka", Moscow, USSR

27. 78074615 CA: 78(12)74615m JOURNAL
Correlations between different characteristics of peat and its bitumen content
AUTHOR: Zhukova, V. P.; Korol, N. T.; Lishtvan, I. I.
LOCATION: Kalinin. Politekh. Inst., Kalinin, USSR
JOURNAL: Khim. Tverd. Topl. DATE: 1972 NUMBER: 5 PAGES: 122-7 CODEN: KTVTAX LANGUAGE: Russian

28. 85035324 CA: 85(6)35324r JOURNAL
Determination of the content of combustibles in boiler entrainments
AUTHOR: Baryshev, V. I.
LOCATION: Beloruss. Filail, Energ. Inst. im. Krzhizhanovskogo, USSR
JOURNAL: Khim. Tverd. Topl. (Moscow) DATE: 1976 NUMBER: 1 PAGES: 143-6 CODEN: KTVTBY LANGUAGE: Russian

29. 85023434 CA: 85(4)23434p JOURNAL
Problem involved in studying the oxidation and spontaneous combustion tendencies of peats
AUTHOR: Karaseva, E. Z.; Shvarts, N. M.; Zil'berbrandt, A. M.; Rakovskii, V. E.
LOCATION: Mosk. Filial, Vses. Nauchno-Issled. Inst. Torf. Prom., Moscow, USSR
JOURNAL: Khim. Tverd. Topl. (Moscow) DATE: 1975 NUMBER: 6 PAGES: 119-23 CODEN: KTVTBY LANGUAGE: Russian

30. 85008041 CA: 85(2)8041q JOURNAL
Some characteristics observed during reaction of solid fuel with an oxidizing agent flowing past it
AUTHOR: Finaev, Yu. A.; Sergeev, G. T.
LOCATION: Inst. Teplo- Mossoobmena, Minsk, USSR
JOURNAL: Vestsi Akad. Navuk B. SSR, Ser. Fiz.-Energ. Navuk DATE: 1976 NUMBER: 1 PAGES: 90-5 CODEN: VAFEAW LANGUAGE: Russian

31. 85008036 CA: 85(2)8036s CONFERENCE PROCEEDING
Calculation of the combustion of solid-fuel particles in the cocurrent-flow part of the flame of a combustion chamber with a low-temperature vortex
AUTHOR: Shestakov, S. M.; Pomerantsev, V. V.; Finker, F. Z.; Dul'neva, L. T.
LOCATION: Leningr. Politekh. Inst. im. Kalinina, Leningrad, USSR
JOURNAL: Gorenie Tverd. Topl., Mater. Vses. Konf., 4th DATE: 1974 VOLUME: 2, PAGES: 42-8 CODEN: 32DBA7 LANGUAGE: Russian PUBLISHER: "Nauka", Sib. Otd., Novosibirsk, USSR

32. 85008035 CA: 85(2)8035r CONFERENCE PROCEEDING
On the combustion of coke with a gas stream flowing past it
AUTHOR: Finaev, Yu. A.
LOCATION: Inst. Teplo- Massoobmena, Minsk, USSR
JOURNAL: Gorenie Tverd. Topl., Mater. Vses. Konf., 4th DATE: 1974 VOLUME: 2, PAGES: 35-8 CODEN: 32DBA7 LANGUAGE: Russian PUBLISHER: "Nauka", Sib. Otd., Novosibirsk, USSR

33. 84182325 CA: 84(26)182325z JOURNAL
Liquefaction of coal and related materials
AUTHOR: Oelert, Hans H.; Siekmann, Rolf
LOCATION: Inst. Tech. Chem., Tech. Univ. Hannover, Hannover, Ger.
JOURNAL: Fuel DATE: 1976 VOLUME: 55 NUMBER: 1 PAGES: 39-42 CODEN: FUELAC LANGUAGE: English

34. 84153017 CA: 84(22)153017v JOURNAL
Principal problems of combustion of peats from the Tyumen Region
AUTHOR: Deev, L. V.; Kutseryb, V. I.
LOCATION: USSR
JOURNAL: Tr. Mosk. Energ. In-ta DATE: 1975 NUMBER: 269 PAGES: 35-42 CODEN: D2JOUP LANGUAGE: Russian
CITATION: Ref. Zh., Teploenerg. 1976, Abstr. No. 2R27

35. 83146345 CA: 83(17)146345b JOURNAL
Chemical characteristics of peaty humic acid fractions and the basis for the specific importance of humic fertilizers
AUTHOR: Dragunov, S. S.; Kablova, N. G.; Bukanova, A. P.
LOCATION: "Geoltorfrazvedka", Moscow, USSR
JOURNAL: Guminovye Udobr. DATE: 1973 VOLUME: 4, PAGES: 24-7 CODEN: GMUDAN LANGUAGE: Russian

36. 83118097 CA: 83(14)118097d CONFERENCE PROCEEDING
Kinetics of chemical reactions of some components of the mineral part of fuel during combustion
AUTHOR: Pomerantsev, V. V.; Likhacheva, G. N.
LOCATION: Leningr. Politekh. Inst., Leningrad, USSR
JOURNAL: Vliyanie Miner. Chasti Energ. Topl. Usloviya Rab. Parogeneratov, Mater. Vses. Konf. DATE: 1974 VOLUME: 1, PAGES: 56-62 CODEN: 30QTAC LANGUAGE: Russian MEETING DATE: 73 PUBLISHER: Tallin. Politekh. Inst., Tallinn, USSR

37. 86174067 CA: 86(24)174067t JOURNAL
Conversion of peat with carbon monoxide and water
AUTHOR: Cavalier, Jean C.; Chornet, Esteban
LOCATION: Dep. Chem. Eng., Univ. Sherbrooke, Sherbrooke, Que.
JOURNAL: Fuel DATE: 1977 VOLUME: 56 NUMBER: 1
PAGES: 57-64 CODEN: FUELAC LANGUAGE: English

38. 86174059 CA: 86(24)174059s JOURNAL
Study of the combustion of milled peat in the furnace of a steam generator
AUTHOR: Deev, L. V.; Kozlov, Yu. A.
LOCATION: USSR
JOURNAL: Tr. Mosk. Energ. Inst. DATE: 1975 VOLUME: 213,
PAGES: 53-8 CODEN: TMEIAX LANGUAGE: Russian

39. 86108995 CA: 86(16)108995t JOURNAL
Thermotechnical properties of ash of Tyumen deposit peats
AUTHOR: Dunskii, V. D.; Tyl'chevskaya, L. I.; Zen'kevich, L. A.; Baryshev, V. I.
LOCATION: USSR
JOURNAL: Elektr. Stn. DATE: 1976 NUMBER: 8 PAGES: 16-18 CODEN: EKSTAP LANGUAGE: Russian

40. 86019295 CA: 86(4)19295x JOURNAL
Problem of slagging of furnace chambers
AUTHOR: Deev, D. V.; Kozlov, Yu. A.
LOCATION: USSR
JOURNAL: Tr. Mosk. Energ. Inst. DATE: 1975 VOLUME: 269,
PAGES: 48-53 CODEN: TMEIAX LANGUAGE: Russian

41. 86007056 CA: 86(2)7056g PATENT
Apparatus and method for producing a fuel gas
INVENTOR(AUTHOR): Kiener, Karl
LOCATION: Ger.
PATENT: France Demande; FR 2277137 DATE: 760130
APPLICATION: Germany; DE 2432504 DATE: 740704
PAGES: 24 pp. CODEN: FRXXBL CLASS: C10B-053/00

42. 88155578 CA: 88(22)155578k CONFERENCE PROCEEDING
Peat gasification for SNG production
AUTHOR: Punwani, D. W.; Bodle, W. W.; Rader, A. M.; Tarman, P. B.
LOCATION: Inst. Gas Technol., Chicago, Ill.
JOURNAL: Proc. Condens. Pap. - Miami Int. Conf. Alternative Energy Sources EDITOR: Veziroglu, T. Nejat (Ed) DATE: 1977 PAGES: 703-5 CODEN: 37NIAB LANGUAGE: English PUBLISHER: Sch. Contin. Stud. Conf. Serv. Univ. Miami, Coral Gables, Fla

43. 88107762 CA: 88(16)107762u JOURNAL
The role of chemical reaction between the humic portion of peat and iron oxides in the production of fuel-melting materials
AUTHOR: Smol'yaninov, S. I.; Krinitsyn, G. G.; Senchenko, A. I.
LOCATION: USSR
JOURNAL: Izv. Tomsk. Politekhn. In-ta DATE: 1977 NUMBER: 214 PAGES: 16-18 CODEN: D4J0U5 LANGUAGE: Russian
CITATION: Ref. Zh., Khim. 1977, Abstr. No. 22P32

44. 88064003 CA: 88(10)64003c JOURNAL
Determination of water content of hydrates and crystallohydrates in boiler primings
AUTHOR: Baryshev, V. I.
LOCATION: Gos. Energ. Inst. im. Krzhizhanovskogo, Moscow, USSR
JOURNAL: Khim. Tverd. Topl. (Moscow) DATE: 1977 NUMBER: 6 PAGES: 121-5 CODEN: KTVTBY LANGUAGE: Russian

45. 87188709 CA: 87(24)188709m JOURNAL
Binding of sulfur with ashes during flame combustion of peat alone and mixed with mazut
AUTHOR: Baryshev, V. I.
LOCATION: Energ. Inst., Minsk, USSR
JOURNAL: Elektr. Stn. DATE: 1977 NUMBER: 6 PAGES: 10-12 CODEN: EKSTAP LANGUAGE: Russian

46. 87154795 CA: 87(20)154795w PATENT
Process and apparatus for producing char and co-products from coal and the like
INVENTOR(AUTHOR): Singh, Alamjit D.
LOCATION: USA
PATENT: United States; US 4039392 DATE: 770802
APPLICATION: United States; US 580561 DATE: 750527
PAGES: 9 pp. CODEN: USXXAM CLASS: 202093000, C10B-001/04

47. 87070743 CA: 87(10)70743q CONFERENCE PROCEEDING
Change in the pore sizes of peat char in relation to combustion loss during activation by steam and carbon dioxide gas
AUTHOR: Drozhalina, N. D.; Volkova, V. G.; Bulgakova, N. O.
LOCATION: USSR
JOURNAL: Sostoyanie Perspekt. Kompleksn. Ispol'z. Torfa EDITOR: Lishtvan, I. I (Ed) DATE: 1975 PAGES: 34-8 CODEN: 35JLAK LANGUAGE: Russian PUBLISHER: "Nauka i Tekhnika", Minsk, USSR

48. 87041626 CA: 87(6)41626y CONFERENCE PROCEEDING
Heat and mass transfer during reaction of solid fuel with an oxidizer
AUTHOR: Finaev, Yu. A.; Sergeev, G. T.
LOCATION: USSR
JOURNAL: Teplomassoobmen, Mater. Vses. Konf. Teplomassoobmenu, 5th EDITOR: Ievlev, V. M (Ed) DATE: 1976 VOLUME: 2, PAGES: 40-9 CODEN: 34RFAZ LANGUAGE: Russian PUBLISHER: Akad. Nauk BSSR, Inst. Teplo- Massoobmena, Minsk, USSR

49. 87025764 CA: 87(4)25764m JOURNAL
Contamination of the heating surfaces of Tyumen heat and electric power plant steam generators during the combustion of locally available peat
AUTHOR: Dunskii, V. D.; Tolchinskii, E. N.; Bulaga, N. A.; Kutseryb, V. I.
LOCATION: Energ. Inst. im. Krzhizhanovskogo, Minsk, USSR
JOURNAL: Teploenergetika (Moscow) DATE: 1976 NUMBER: 11 PAGES: 55-9 CODEN: TPLOA5 LANGUAGE: Russian

50. 86194124 CA: 86(26)194124n JOURNAL
Equations and nomographs for applying the German air-pollution control standards
AUTHOR: Schwanecke, R.
LOCATION: Darmstadt, Ger.
JOURNAL: Wasser, Luft Betr. DATE: 1976 VOLUME: 20 NUMBER: 11 PAGES: 607-10 CODEN: WSLBAK LANGUAGE: German

51. 90041164 CA: 90(6)41164h JOURNAL
Contamination of heating surfaces during combustion of shredded peat
AUTHOR: Deev, L. V.
LOCATION: USSR
JOURNAL: Tr. Mosk. Energ. Inst. DATE: 1977 VOLUME: 330, PAGES: 105-12 CODEN: TMEIAX ISSN: 0371-9545 LANGUAGE: Russian

52. 89217584 CA: 89(26)217584r JOURNAL
Re: peat
AUTHOR: Bodle, William W.; Punwani, Dharam V.; Mensinger, Michael C.
LOCATION: Inst. Gas Technol., Chicago, Ill.
JOURNAL: CHEMTECH DATE: 1978 VOLUME: 8 NUMBER: 9 PAGES: 559-63 CODEN: CHTEDD ISSN: 0009-2703 LANGUAGE: English

53. 89200170 CA: 89(24)200170e JOURNAL
Structure and composition of deposits in the burning of Tyumen peat
AUTHOR: Baryshev, V. I.; Zen'kevich, L. A.; Tyl'chevskaya, L. I.
LOCATION: Energ. Inst. im. Krzhizhanovskogo, Minsk, USSR
JOURNAL: Elektr. Stn. DATE: 1978 NUMBER: 9 PAGES: 18-21 CODEN: EKSTAP ISSN: 0013-5372 LANGUAGE: Russian

54. 89182176 CA: 89(22)182176e CONFERENCE PROCEEDING
Heavy metal distributions and their significance in Finnish peat bogs
AUTHOR: Yliruokanen, I.
LOCATION: Dep. Chem., Helsinki Univ. Technol., Espoo, Finland
JOURNAL: Proc. Int. Peat Congr., 5th DATE: 1976 VOLUME: 2, PAGES: 276-83 CODEN: 39CNAJ LANGUAGE: English
PUBLISHER: Wydawn. Czas. Tech. NOT, Warsaw, Pol

55. 89182175 CA: 89(22)182175d JOURNAL
Formation of pyrophoric substances during the self-heating of peat
AUTHOR: Falyushin, P. L.; Lishtvan, I. I.; Kashinskaya, T. Ya.
LOCATION: Inst. Torfa, Minsk, USSR
JOURNAL: Vestsi Akad. Navuk BSSR, Ser. Khim. Navuk DATE: 1978 NUMBER: 4 PAGES: 103-7 CODEN: VBSKAK ISSN: 0002-3590 LANGUAGE: Russian

89132189 CA: 89(16)132189r TECHNICAL REPORT

56. **Peat gasification for SNG production**
AUTHOR: Punwani, D. V.; Rader, A. M.
LOCATION: Sci. Appl., Inc., Huntsville, Ala.
JOURNAL: Report DATE: 1977 NUMBER: CONF-771092-3
PAGES: 30 pp. CODEN: D3REP3 LANGUAGE: English
CITATION: Energy Res. Abstr. 1978, 3(10), Abstr. No. 22755
AVAIL: NTIS

57. 89113621 CA: 89(14)113621j JOURNAL
Boiler inspection of the flue gas dewpoint of peat fuel
AUTHOR: Kurki-Suonio, I.; Makipaja, L.
LOCATION: Lampotek. Koneopin Laitos, Tampereen Tek. Korkeakoulu, Tampere, Finland
JOURNAL: Tutkimus Tek. DATE: 1977 NUMBER: 1 PAGES: 7-10 CODEN: TITKAR LANGUAGE: Finnish

58. 89092123 CA: 89(12)92123f JOURNAL
Change in some properties of peat and its combustion products with respect to fractions
AUTHOR: Baryshev, V. I.; Zen'kevich, L. A.; Tyl'chevskaya, L. I.
LOCATION: Gos. Nauchno-Issled. Energ. Inst. im. [illegible]hizhanovskogo, Minsk, USSR
JOURNAL: Khim. Tverd. Topl. (Moscow) DATE: 1978 NUMBER: 3 PAGES: 65-8 CODEN: KTVTBY LANGUAGE: Russian

59. 88194261 CA: 88(26)194261w JOURNAL
Liquefaction of peat
AUTHOR: Oelert, H. H.; Dhinh Van, T.; Son, N. N.
LOCATION: Inst. Chem. Technol. Brennstofftech., Tech. Univ. Clausthal, Clausthal-Zellerfeld, Ger.
JOURNAL: Chem.-Ing.-Tech. DATE: 1977 VOLUME: 49 NUMBER: 11 PAGES: 913 CODEN: CITEAH ISSN: 0009-286X LANGUAGE: German

60. 88155579 CA: 88(22)155579m JOURNAL
Oxygen content in flue gases during combustion of peat
AUTHOR: Opman, Ya. S.; Sleptsov, V. F.
LOCATION: Beloruss. Gos. Inst. Proekt. Predpr. Torf. Prom., Minsk, USSR
JOURNAL: Torf. Prom-st. DATE: 1977 NUMBER: 11 PAGES: 26 CODEN: TORPAV ISSN: 0040-9472 LANGUAGE: Russian

61. 90156683 CA: 90(20)156683u PATENT
Method and apparatus for treating radioactively contaminated solvent wastes
INVENTOR(AUTHOR): Mallek, Heinz; Jablonski, Werner; Plum, Willi
LOCATION: Ger.
ASSIGNEE: Kernforschungsanlage Juelich G.m.b.H.
PATENT: Germany Offen.; DE 2729325 DATE: 790111
APPLICATION: Germany; DE 2729325 DATE: 770629
PAGES: 12 pp. CODEN: GWXXBX CLASS: G21F-009/04

62. 90154703 CA: 90(20)154703b PATENT
Making coke from cellulosic materials and fuels thus produced
INVENTOR(AUTHOR): Koppelman, Edward
LOCATION: USA
PATENT: United States; US 4129420 DATE: 781212
APPLICATION: United States; US 648170 DATE: 760112
PAGES: 9 pp. Cont.-in-part of U.S. 4,052,168. CODEN: USXXAM CLASS: 044051000, C10L-001/32

63. 90154526 CA: 90(20)154526w JOURNAL
Experiences of fluidized-bed combustion of peat in Finland
AUTHOR: Jahkola, Antero
LOCATION: Helsinki Univ. Technol., Helsinki, Finland
JOURNAL: Proc. Int. Conf. Fluid. Bed Combust. DATE: 1978 VOLUME: 5 NUMBER: 2 PAGES: 375-84 CODEN: PCFCDB LANGUAGE: English MEETING DATE: 77

64. 90140073 CA: 90(18)140073j CONFERENCE PROCEEDING
Basic gasification studies for development of biomass medium-BTU gasification process
AUTHOR: Rensfelt, E.; Blomkvist, G.; Ekstrom, C.; Engstrom, S.; Espenas, B. G.; Liinanki, L.
LOCATION: Dep. Chem. Technol., Royal Inst. Technol., Stockholm, Swed.
JOURNAL: Symp. Pap.: Energy Biomass Wastes DATE: 1978 PAGES: 465-94 CODEN: 39VWAS LANGUAGE: English PUBLISHER: IGT, Chicago, Ill

65. 90127066 CA: 90(16)127066q JOURNAL
Sulfation of the ash residues from peat
AUTHOR: Baryshev, V. I.; Tyl'chevskaya, L. I.; Zen'kevich, L. A.
LOCATION: Energ. Inst. im. Es'man, Baku, USSR
JOURNAL: Teploenergetika (Moscow) DATE: 1978 NUMBER: 8 PAGES: 27-30 CODEN: TPLOA5 ISSN: 0040-3636 LANGUAGE: Russian

66. 90124294 CA: 90(16)124294b TECHNICAL REPORT
Hydrogasifier development for the Hydrane process
AUTHOR: Combs, L. P.; Greene, M. I.
LOCATION: Rocketdyne, Canoga Park, Calif.
JOURNAL: Report DATE: 1978 NUMBER: FE-2518-18 PAGES: 42 pp. CODEN: D3REP3 LANGUAGE: English CITATION: Energy Res. Abstr. 1978, 3(17), Abstr. No. 38748 AVAIL: NTIS

67. 90105927 CA: 90(14)105927u JOURNAL
A rapid method for investigation of ash deposition in boilers
AUTHOR: Hupa, Mikko; Eriksson, Bo Erik; Klingstedt, Gunnar
LOCATION: Dep. Inorg. Chem., Abo Akad., Abo, Finland
JOURNAL: Pap. Puu DATE: 1978 VOLUME: 60 NUMBER: 11 PAGES: 719-22 CODEN: PAPUAU ISSN: 0031-1243 LANGUAGE: English

68. 90089835 CA: 90(12)89835e JOURNAL
Low-temperature corrosion in the cocombustion of peat and mazut
AUTHOR: Baryshev, V. I.; Tyl'chevskaya, L. I.; Zen'kevich, L. A.; Gol'din, G. N.
LOCATION: Energ. Inst. im. Krzhizhanovskogo, Moscow, USSR
JOURNAL: Izv. Vyssh. Uchebn. Zaved., Energ. DATE: 1978 VOLUME: 21 NUMBER: 11 PAGES: 60-3 CODEN: IVZEAY ISSN: 0579-2983 LANGUAGE: Russian

69. 90074176 CA: 90(10)74176s CONFERENCE PROCEEDING
Synthetic natural gas production from peat
AUTHOR: Punwani, D. V.; Bodle, W. W.; Tarman, P. B.; Rader, A. M.
LOCATION: Inst. Gas Technol., Chicago, Ill.
JOURNAL: Alternative Energy Sources, (Proc. Miami Int. Conf.)
EDITOR: Veziroglu, T. Nejat (Ed) DATE: 1978 VOLUME: 7, PAGES: 3087-112 CODEN: 39WSAW LANGUAGE: English MEETING DATE: 77 PUBLISHER: Hemisphere, Washington, D. C

70. 91213656 CA: 91(26)213656j JOURNAL
Biomethanation of Minnesota reed sedge peat
AUTHOR: Ghosh, Sambhunath; Klass, Donald L.
LOCATION: Inst. Gas Technol., Illinois Inst. Technol. Cent., Chicago, IL, 60616, USA
JOURNAL: Resour. Recovery Conserv. DATE: 1979 VOLUME: 4 NUMBER: 2 PAGES: 115-39 CODEN: RRCODN ISSN: 0304-3967 LANGUAGE: English

71. 91195715 CA: 91(24)195715w JOURNAL
Synthetic natural gas from peat
AUTHOR: Rader, Arnold M.
LOCATION: Minnesota Gas Co., Minneapolis, MN, 55426, USA
JOURNAL: Ind. Eng. Chem. Prod. Res. Dev. DATE: 1979 VOLUME: 18 NUMBER: 4 PAGES: 291-6 CODEN: IEPRA6 ISSN: 0019-7890 LANGUAGE: English

72. 91160145 CA: 91(20)160145h TECHNICAL REPORT
SNG from peat by the PEATGAS Process
AUTHOR: Punwani, D. V.; Arora, J. L.; Tsaros, C. L.
LOCATION: Inst. Gas Technol., Chicago, IL, USA
JOURNAL: Report DATE: 1978 NUMBER: CONF-780891-1 PAGES: 19 pp. CODEN: D3REP3 LANGUAGE: English CITATION: Energy Res. Abstr. 1979, 4(10), Abstr. No. 25756 AVAIL: NTIS

73. 91143143 CA: 91(18)143143p PATENT
Continuous feeding of water-containing fossil fuels to a pressure gasification and/or combustion zone
INVENTOR(AUTHOR): Boegner, Friedrich
LOCATION: Fed. Rep. Ger.
ASSIGNEE: Davy Powergas G.m.b.H.
PATENT: Germany Offen.; DE 2757918 DATE: 790628
APPLICATION: Germany; DE 2757918 DATE: 771224
PAGES: 16 pp. CODEN: GWXXBX LANGUAGE: German
CLASS: C10J-003/50, F23B-007/00, C10J-003/00, F23K-001/04

74. 91142811 CA: 91(18)142811t TECHNICAL REPORT
Combustion of low-grade coal
AUTHOR: Morrison, G. F.
LOCATION: Coal Res., IEA, London, Engl.
JOURNAL: Report DATE: 1978 NUMBER: ICTIS/TR-02 PAGES: 91 pp. CODEN: D3REP3 LANGUAGE: English CITATION: Energy Res. Abstr. 1979, 4(10), Abstr. No. 25344 AVAIL: IEA Coal Res., London, Engl

91094157 CA: 91(12)94157k JOURNAL

75. **Noncatalytic liquefaction of brown coal and peat**
AUTHOR: Oelert, Hans Henning; Siekmann, Rolf; Saied, H. E.
LOCATION: Inst. Chem. Technol. Brennstofftech., Tech. Univ., Clausthal, Fed. Rep. Ger.
JOURNAL: Koks, Smola, Gaz DATE: 1978 VOLUME: 23 NUMBER: 11 PAGES: 326-30 CODEN: KSMGAA ISSN: 0023-2823 LANGUAGE: Polish

76. 91059960 CA: 91(8)59960v TECHNICAL REPORT
Peat hydrogasification
AUTHOR: Weil, S. A.; Nandi, S. P.; Punwani, D. V.; Kopstein, M. J.
LOCATION: Inst. Gas Technol., Chicago, IL, USA
JOURNAL: Report DATE: 1978 NUMBER: CONF-780902-8 PAGES: 13 pp. CODEN: D3REP3 LANGUAGE: English CITATION: Energy Res. Abstr. 1979, 4(1), Abstr. No. 25 AVAIL: NTIS

77. 91059959 CA: 91(8)59959b TECHNICAL REPORT
Peat gasification: an experimental study
AUTHOR: Punwani, D. V.; Nandi, S. P.; Gavin, L. W.; Johnson, J. L.
LOCATION: Inst. Gas Technol., Chicago, IL, USA
JOURNAL: Report DATE: 1978 NUMBER: CONF-780611-8 PAGES: 34 pp. CODEN: D3REP3 LANGUAGE: English CITATION: Energy Res. Abstr. 1978, 3(24), Abstr. No. 56332 AVAIL: NTIS

78. 91023467 CA: 91(4)23467a TECHNICAL REPORT
Gasification of peat: a literature review
AUTHOR: Leppaemaeki, E.; Asplund, D.; Ekman, E.
LOCATION: Valtion Tek. Tutkimuskeskus, Helsinki, Finland
JOURNAL: Report DATE: 1976 NUMBER: ND-23271 PAGES: 56 pp. CODEN: D3REP3 LANGUAGE: English CITATION: Energy Res. Abstr. 1978, 3(23), Abstr. No. 54276 AVAIL: NTIS(US Sales Only)

79. 90171252 CA: 90(22)171252w JOURNAL
Conversion of peat; gasification-liquefaction
AUTHOR: Cavalier, J. C.; Chornet, E.
LOCATION: Fac. Sci. Appl., Univ. Sherbrooke, Sherbrooke, Que.
JOURNAL: Ann. ACFAS DATE: 1976 VOLUME: 43 NUMBER: 2 PAGES: 81-98 CODEN: AACFAR ISSN: 0066-8842 LANGUAGE: French

80. 92025326 CA: 92(4)25326y JOURNAL
Synthetic fuels from peat gasification
AUTHOR: Punwani, D. V.; Weil, S. A.; Paganessi, J. E.; Kopstein, M. J.
LOCATION: Inst. Gas Technol., Chicago, IL, 60616, USA
JOURNAL: Proc. Intersoc. Energy Convers. Eng. Conf. DATE: 1979 VOLUME: 14th NUMBER: Vol. 1 PAGES: 862-7
CODEN: PIECDE ISSN: 0146-955X LANGUAGE: English

81. 92010534 CA: 92(2)10534r JOURNAL
Capillary GC-MS analysis of PAH emissions from combustion of peat and wood in a hot water boiler
AUTHOR: Alsberg, Tomas; Stenberg, Ulf
LOCATION: Dep. Anal. Chem., Univ. Stockholm, S-106 91, Stockholm, Swed.
JOURNAL: Chemosphere DATE: 1979 VOLUME: 8 NUMBER: 7
PAGES: 487-96 CODEN: CMSHAF ISSN: 0045-6535 LANGUAGE: English

82. 92008795 CA: 92(2)8795h PATENT
Method and apparatus for continuous production of high-grade producer gas and water gas
LOCATION: Switz.
ASSIGNEE: PPS Polyvalent Patent Service A.-G.
PATENT: European Pat. Appl.; EP 1857 DATE: 790516
APPLICATION: Switzerland; CH 7713206 DATE: 771031
PAGES: 23 pp. CODEN: EPXXDW LANGUAGE: German
CLASS: C10J-003/06, C10J-003/20, C10J-003/66, C01B-002/00

83. 92008794 CA: 92(2)8794g PATENT
Method and apparatus for continuous production of producer gas and water gas
LOCATION: Switz.
ASSIGNEE: PPS Polyvalent Patent Service A.-G.
PATENT: European Pat. Appl.; EP 1856 DATE: 790516
APPLICATION: Switzerland; CH 7713205 DATE: 771031
PAGES: 38 pp. CODEN: EPXXDW LANGUAGE: German
CLASS: C10J-003/06, C10J-003/14, C10J-003/66, C01B-002/00

84. 92008686 CA: 92(2)8686y JOURNAL
Effect of the composition of the acidic phase on low-temperature corrosion
AUTHOR: Bakinovskaya, Ya. B.; Baryshev, V. I.
LOCATION: "Belenergoremnalatka", USSR
JOURNAL: Teploenergetika (Moscow) DATE: 1979 NUMBER: 8
PAGES: 59-61 CODEN: TPLOA5 ISSN: 0040-3636 LANGUAGE: Russian

85. 92165921 CA: 92(20)165921p TECHNICAL REPORT
Suitability of different gasification processes for energy production in Sweden
AUTHOR: Fornhammar, U.; Maijgren, B.; Kelen, T.
LOCATION: Studsvik Energitek. AB, Nykoeping, Swed.
JOURNAL: Report DATE: 1979 NUMBER: STUDSVIK/E-4-79/7
PAGES: 76 pp. CODEN: D3REP3 LANGUAGE: Swedish
CITATION: Energy Res. Abstr. 1979, 4(22), Abstr. No. 52733
AVAIL: NTIS

86. 92150433 CA: 92(18)150433g TECHNICAL REPORT
Principles of trace element content in peats with different spontaneous combustion tendencies
AUTHOR: Runkov, S. V.; Shurganov, V. V.; Kozlovskaya, N. A.
LOCATION: Kalinin. Politekh. Inst., Kalinin, USSR
JOURNAL: Deposited Doc. DATE: 1978 NUMBER: VINITI 3809-78 PAGES: 216-20 CODEN: D8DEP2 LANGUAGE: Russian
AVAIL: VINITI

87. 92149788 CA: 92(18)149788v JOURNAL
Liquefaction of Hula peat
AUTHOR: Ikan, R.; Ginzburg, V.; Ioselis, P.; Hoffer, D.; Brenner, S.; Klein, J.
LOCATION: Dep. Org. Chem., Hebrew Univ. Jerusalem, Jerusalem, Israel
JOURNAL: Isr. J. Technol. DATE: 1979 VOLUME: 17 NUMBER: 1 PAGES: 29-35 CODEN: ISJTAC ISSN: 0021-2202
LANGUAGE: English

88. 92149787 CA: 92(18)149787u JOURNAL
Production of energy from peat
AUTHOR: Asplund, Dan
LOCATION: Poltto- Voiteluainelab., Espoo, Finland
JOURNAL: Tied. - Valt. Tek. Tutkimuskeskus, Poltto-Voiteluainelab. DATE: 1978 VOLUME: 21, PAGES: 36 pp.
CODEN: TVTVD9 ISSN: 0355-3590 LANGUAGE: Finnish

89. 92149775 CA: 92(18)149775p JOURNAL
Potential applications of fuel gas with low calorific value produced from peat
AUTHOR: Jantunen, Markku; Asplund, Dan
LOCATION: Espoo, Finland
JOURNAL: Tied. - Valt. Tek. Tutkimuskeskus, Poltto-Voiteluainelab. DATE: 1978 VOLUME: 20, PAGES: 75 pp.
CODEN: TVTVD9 ISSN: 0355-3590 LANGUAGE: Finnish

90. 92149533 CA: 92(18)149533h JOURNAL
Minnesota Gas Company peat gasification program
AUTHOR: Rader, Arnold M.
LOCATION: Minnesota Gas Co., MN, USA
JOURNAL: Oper. Sect. Proc. - Am. Gas Assoc. DATE: 1979
PAGES: T336-T339 CODEN: POAGAB ISSN: 0099-7250
LANGUAGE: English

91. 92096569 CA: 92(12)96569r JOURNAL
Peat for power
AUTHOR: Othmer, Donald F.
LOCATION: Polytech. Inst. New York, Brooklyn, NY, 11201, USA
JOURNAL: Proc. Symp. Comm. 2 (Int. Peat Soc.) DATE: 1978
NUMBER: Peat Ind. PAGES: 287-98 CODEN: PSCSDK
LANGUAGE: English

92. 92081569 CA: 92(10)81569s JOURNAL
Combustion and explosion parameters of dusts
AUTHOR: Scholl, E. W.; Reeh, D.; Wiemann, W.; Faber, M.; Kuehnen, G.; Beck, H.; Glienke, N.
LOCATION: Inst. Explos. Sprengtech., Bergbau-Versuchsstrecke, Fed. Rep. Ger.
JOURNAL: STF-Rep. DATE: 1979 NUMBER: 2 PAGES: 99 pp.
CODEN: STRPDO LANGUAGE: German

93. 92061308 CA: 92(8)61308c JOURNAL
Production of methanol from peat
AUTHOR: Ettala, Juha; Asplund, Dan
LOCATION: Tech. Res. Cent. Finland, Valt. Tek. Tutkimuskeskus, 02150/15, Espoo, Finland
JOURNAL: Tied. - Valt. Tek. Tutkimuskeskus, Poltto-Voiteluainelab. DATE: 1979 VOLUME: 22, PAGES: 30 pp.
CODEN: TVTVD9 ISSN: 0355-3590 LANGUAGE: English

94. 92044421 CA: 92(6)44421s JOURNAL
Relation of temperature characteristics to chemical composition of the ashes of solid fuels
AUTHOR: Baryshev, V. I.
LOCATION: Energ. Inst., Minsk, USSR
JOURNAL: Khim. Tverd. Topl. (Moscow) DATE: 1979 NUMBER: 5 PAGES: 81-5 CODEN: KTVTBY LANGUAGE: Russian

95. 93170828 CA: 93(18)170828p CONFERENCE PROCEEDING
Peat gasification in a spray nozzle fluidized bed
AUTHOR: Jaouich, B. Alfred; Cauchy, Pierre; Pilon, Adrien
LOCATION: Univ. Quebec, Montreal, PQ, Can.
JOURNAL: Actes Colloq. Fr.-Que. Energ. Biomasses DATE: 1979
PAGES: 203-12 CODEN: 44CVAJ LANGUAGE: French
PUBLISHER: Informatech France-Quebec, Montreal, Que

96. 93170827 CA: 93(18)170827n CONFERENCE PROCEEDING
Electricity production starting from peat gasification
AUTHOR: Chamberland, Andre
LOCATION: Inst. Rech. Hydro-Quebec, Quebec, PQ, Can.
JOURNAL: Actes Colloq. Fr.-Que. Energ. Biomasses DATE: 1979
PAGES: 105-25 CODEN: 44CVAJ LANGUAGE: French
PUBLISHER: Informatech France-Quebec, Montreal, Que

97. 93152804 CA: 93(16)152804y JOURNAL
Sulfur absorption by ash in the chamber combustion of fuels
AUTHOR: Baryshev, V. I.; Gol'din, G. N.
LOCATION: Beloruss. Filial., Energ. Inst. im. Krzhizhanovskogo, USSR
JOURNAL: Khim. Tverd. Topl. (Moscow) DATE: 1980 NUMBER: 4 PAGES: 72-3 CODEN: KTVTBY LANGUAGE: Russian

98. 93075373 CA: 93(8)75373c JOURNAL
Sulfation of deposits and entrainment in combustion of peat and its mixture with fuel oil
AUTHOR: Baryshev, V. I.; Tyl'chevskaya, L. I.; Zen'kevich, L. A.; Gol'din, G. N.
LOCATION: Beloruss. Filial, Energ. Inst. im. Krzhizhanovskogo, Minsk, USSR
JOURNAL: Elektr. Stn. DATE: 1980 NUMBER: 5 PAGES: 15-18 CODEN: EKSTAP ISSN: 0013-5372 LANGUAGE: Russian

99. 93050209 CA: 93(6)50209r TECHNICAL REPORT
Synthetic fuels from peat gasification
AUTHOR: Punwani, D. V.; Weil, S. A.; Paganessi, J. E.; Kopstein, M. J.
LOCATION: Inst. Gas Technol., Chicago, IL, USA
JOURNAL: Report DATE: 1979 NUMBER: CONF-790803-55
PAGES: 7 pp. CODEN: D3REP3 LANGUAGE: English
CITATION: Energy Res. Abstr. 1980, 5(1), Abstr. No. 2
AVAIL: NTIS

100. 93010407 CA: 93(2)10407x JOURNAL
Peat as a future source of organic raw materials
AUTHOR: Morita, H.
LOCATION: Chem. Biol. Res. Inst., Agric. Canada, Ottawa, ON, Can., K1A 0C6
JOURNAL: Chem. Can. DATE: 1980 VOLUME: 32 NUMBER: 3
PAGES: 18-19, 27 CODEN: CHCAAF ISSN: 0009-3114
LANGUAGE: English

101. 92166334 CA: 92(20)166334m PATENT
Gaseous fuel from marsh mud
INVENTOR(AUTHOR): Reijonen, Veli E.
LOCATION: Finland
PATENT: Finland; FI 56551 DATE: 791031
APPLICATION: Finland; FI 734022 DATE: 731228
PAGES: 5 pp. CODEN: FIXXAP LANGUAGE: Finnish
CLASS: C10L-003/00, C10J-005/00

102. 92166216 CA: 92(20)166216z TECHNICAL REPORT
Material problems at combustion and gasification of biomass (peat and wood products)
AUTHOR: Tarkpea, P.
LOCATION: Studsvik Energitek. AB, Nykoeping, Swed.
JOURNAL: Report DATE: 1979 NUMBER: STUDSVIK/E2-79/36
PAGES: 42 pp. CODEN: D3REP3 LANGUAGE: Swedish
CITATION: Energy Res. Abstr. 1979, 4(22), Abstr. No. 52799
AVAIL: NTIS

103. 92166213 CA: 92(20)166213w JOURNAL
Peat gasification - an experimental study
AUTHOR: Punwani, D. V.; Nandi, S. P.; Gavin, L. W.; Johnson, J. L.
LOCATION: Inst. Gas Technol., Chicago, IL, USA
JOURNAL: Coal Process. Technol. DATE: 1979 VOLUME: 5, PAGES: 117-27 CODEN: CPRTD2 ISSN: 0147-1708 LANGUAGE: English

104. 92166208 CA: 92(20)166208y JOURNAL
Production of fuel gas from peat
AUTHOR: Asplund, Dan; Salo, Kari
LOCATION: Poltto- Voiteluainelab., Valtion Tek. Tutkimuskeskus, 02150/15, Espoo, Finland
JOURNAL: Suo DATE: 1979 VOLUME: 30 NUMBER: 3
PAGES: 59-64 CODEN: SUODAA ISSN: 0039-5471 LANGUAGE: Finnish

105. 94086663 CA: 94(12)86663u CONFERENCE PROCEEDING
Direct combustion of peat for electric power generation
AUTHOR: Leppa, Kalevi
LOCATION: Energy Serv., Ekono, Inc., Bellevue, WA, USA
JOURNAL: Manage. Assess. Peat Energy Resour., Exec. Conf. Proc. DATE: 1980 PAGES: 27-44 CODEN: 44TYAB
LANGUAGE: English MEETING DATE: 79 PUBLISHER: IGT, Chicago, Ill

106. 94049945 CA: 94(8)49945s JOURNAL
Availability and utilization of peat and lignite as boiler fuel
AUTHOR: Leppa, Kalevi
LOCATION: Manager Energy Serv., Ekono Inc., Bellevue, WA, 98004, USA
JOURNAL: Eng. Conf., (Proc.) DATE: 1980 NUMBER: 2
PAGES: 239-41 CODEN: ECOPD8 LANGUAGE: English

107. 94033394 CA: 94(6)33394a JOURNAL
Peat char gasification - laboratory and PDU (Process Development Unit)-scale studies
AUTHOR: Punwani, D. V.; Weil, S. A.; Pyrcioch, E. J.; Nandi, S. P.
LOCATION: Inst. Gas Technol., Chicago, IL, 60616, USA
JOURNAL: Proc. Intersoc. Energy Convers. Eng. Conf. DATE: 1980 VOLUME: 15th NUMBER: 2 PAGES: 964-9 CODEN: PIECDE ISSN: 0146-955X LANGUAGE: English

108. 94033391 CA: 94(6)33391x JOURNAL
Feasibility of a peat biogasification process
AUTHOR: Bulvid, M. G.; Wise, D. L.; Rader, A. M.; McCarty, P. L.; Owen, W. F.
LOCATION: Dynatech R/D Co., Cambridge, MA, 02139, USA
JOURNAL: Resour. Recovery Conserv. DATE: 1980 VOLUME: 5 NUMBER: 2 PAGES: 117-38 CODEN: RRCODN ISSN: 0304-3967 LANGUAGE: English

109. 94033142 CA: 94(6)33142s JOURNAL
Status of peat biogasification development
AUTHOR: Bulvid, M. G.; Rader, A. M.; Kopstein, M. J.
LOCATION: Dynatech R/D Co., Cambridge, MA, 02139, USA
JOURNAL: Proc. Intersoc. Energy Convers. Eng. Conf. DATE: 1980 VOLUME: 15th NUMBER: 2 PAGES: 959-63 CODEN: PIECDE ISSN: 0146-955X LANGUAGE: English

110. 94018095 CA: 94(4)18095k JOURNAL
Liquid products from peat pyrolysis
AUTHOR: Duncan, Dennis A.; Paganessi, Joseph
LOCATION: Inst. Gas Technol., Chicago, IL, USA
JOURNAL: Proc. Intersoc. Energy Convers. Eng. Conf. DATE: 1980 VOLUME: 15th NUMBER: 2 PAGES: 1579-85 CODEN: PIECDE ISSN: 0146-955X LANGUAGE: English

111. 94017341 CA: 94(4)17341a PATENT
Wet combustion of an aqueous liquid by batch processing
INVENTOR(AUTHOR): Othmer, Donald F.
LOCATION: USA
PATENT: Canada; CA 1087129 DATE: 801007
APPLICATION: Canada; CA 275433 DATE: 770404
PAGES: 48 pp. CODEN: CAXXA4 LANGUAGE: English
CLASS: D21C-011/14

112. 93242374 CA: 93(26)242374n JOURNAL
A contribution to the kinetics of the gasification of peat coke with carbon dioxide-carbon monoxide gas mixtures
AUTHOR: Haavisto, I.; Gudenau, H. W.
LOCATION: Otaniemi, Finland
JOURNAL: Aufbereit.-Tech. DATE: 1980 VOLUME: 21 NUMBER: 6 PAGES: 319-23 CODEN: AUFTAK ISSN: 0004-783X
LANGUAGE: English; German

113. 93224877 CA: 93(24)224877z JOURNAL
Experiment in adopting MVT wet ash traps for removing peat ash from flue gases
AUTHOR: Oksenkrug, E. S.; Bel'man, V. I.; Korelkin, G. N.
LOCATION: "Uraltekhenergo", USSR
JOURNAL: Energetik DATE: 1980 NUMBER: 5 PAGES: 30-2
CODEN: EGTKA9 ISSN: 0013-7278 LANGUAGE: Russian

114. 93222694 CA: 93(24)222694p JOURNAL
Vehicle gas producers
AUTHOR: Donath, Ernest E.
LOCATION: Christiansted, Virgin I., 00520
JOURNAL: Fuel Process. Technol. DATE: 1980 VOLUME: 3 NUMBER: 2 PAGES: 141-53 CODEN: FPTEDY ISSN: 0378-3820
LANGUAGE: English

115. 94177753 CA: 94(22)177753q JOURNAL
Combustion of low-grade fuels in a fluidized bed
AUTHOR: Hampartsoumian, E.; Gibbs, B. M.
LOCATION: Dep. Fuel Energy, Leeds Univ., Leeds, Engl.
JOURNAL: IEE Conf. Publ. DATE: 1981 VOLUME: 192 NUMBER: Int. Conf. Future Energy Concepts, 3rd PAGES: 219-23 CODEN: IECPB4 ISSN: 0018-9405 LANGUAGE: English

116. 94159239 CA: 94(20)159239x JOURNAL
The technology of peat
AUTHOR: Lindstroem, Olle
LOCATION: Dep. Chem. Technol., R. Inst. Technol., S-100 44, Stockholm, Swed.
JOURNAL: Ambio DATE: 1980 VOLUME: 9 NUMBER: 6 PAGES: 309-13 CODEN: AMBOCX ISSN: 0044-7447 LANGUAGE: English

117. 94144584 CA: 94(18)144584g CONFERENCE PROCEEDING
Effects of peat harvesting and gasification on air quality
AUTHOR: Ertugrul, Altay M.; Sober, R. F.
LOCATION: Environ. Serv., Williams Brothers Eng. Co., Tulsa, OK, 74177, USA
JOURNAL: Manage. Assess. Peat Energy Resour., Exec. Conf. Proc. DATE: 1980 PAGES: 173-88 CODEN: 44TYAB LANGUAGE: English MEETING DATE: 79 PUBLISHER: IGT, Chicago, Ill

118. 94144499 CA: 94(18)144499h CONFERENCE PROCEEDING
Peat and the environment
Williams Brothers Engineering Co.
LOCATION: Resour. Sci. Cent., Tulsa, OK, USA
JOURNAL: Manage. Assess. Peat Energy Resour., Exec. Conf. Proc. DATE: 1980 PAGES: 241-56 CODEN: 44TYAB LANGUAGE: English MEETING DATE: 79 PUBLISHER: IGT, Chicago, Ill

119. 94142148 CA: 94(18)142148u JOURNAL
Synthetic fuels from peat: state-of-the-art review
AUTHOR: Punwani, D. V.
LOCATION: Inst. Gas Technol., USA
JOURNAL: Energy Technol. DATE: 1980 VOLUME: 7, PAGES: 1375-95 CODEN: ENTED9 ISSN: 0161-6048 LANGUAGE: English

120. 94106172 CA: 94(14)106172p JOURNAL
The conversion of peat and humic materials into liquid fuels using carbon monoxide
AUTHOR: Chornet, E.; Fonseca, R.; Grandbois, M.; Brown, R. P.
LOCATION: Fac. Sci. Appl., Univ. Sherkrooke, Sherbrooke, PQ, Can., J1K 2R1
JOURNAL: Can. J. Chem. Eng. DATE: 1980 VOLUME: 58 NUMBER: 6 PAGES: 713-17 CODEN: CJCEA7 ISSN: 0008-4034 LANGUAGE: English

121. 94106138 CA: 94(14)106138g JOURNAL
Thermodynamics of coal gasification by various means of gasification
AUTHOR: Neumann, Klaus Kurt; Keil, Frerich; Nitschke, Eberhard
LOCATION: Uhde G.m.b.H., 4600/1, Dortmund, Fed. Rep. Ger.
JOURNAL: Chem.-Ing.-Tech. DATE: 1980 VOLUME: 52 NUMBER: 11 PAGES: 908-9 CODEN: CITEAH ISSN: 0009-286X LANGUAGE: German

122. 94086919 CA: 94(12)86919g JOURNAL
Liquefaction of Swedish peats
AUTHOR: Bjoernbom, Pehr; Granath, Lena; Kannel, Arne; Karlsson, Gerth; Lindstroem, Lars; P-Bjoernbom, Emilia
LOCATION: Dep. Chem. Technol., R. Inst. Technol., S-100 44, Stockholm, Swed.
JOURNAL: Fuel DATE: 1981 VOLUME: 60 NUMBER: 1 PAGES: 7-13 CODEN: FUELAC ISSN: 0016-2361 LANGUAGE: English

123. 94086665 CA: 94(12)86665w CONFERENCE PROCEEDING
Gasification of peat - a literature review
AUTHOR: Leppamaki, Eero; Asplund, Dan; Ekman, Erkki
LOCATION: Fuel Lubr. Res. Lab., Tech. Res. Cent. Finland, 02150/15, Espoo, Finland
JOURNAL: Manage. Assess. Peat Energy Resour., Exec. Conf. Proc. DATE: 1980 PAGES: 291-327 CODEN: 44TYAB LANGUAGE: English MEETING DATE: 79 PUBLISHER: IGT, Chicago, Ill

124. 94086664 CA: 94(12)86664v CONFERENCE PROCEEDING
Synthetic fuels from peat
AUTHOR: Punwani, D. V.
LOCATION: Chem. Process. Res. Div., Inst. Gas Technol., Chicago, IL, 60616, USA
JOURNAL: Manage. Assess. Peat Energy Resour., Exec. Conf. Proc. DATE: 1980 PAGES: 49-83 CODEN: 44TYAB LANGUAGE: English MEETING DATE: 79 PUBLISHER: IGT, Chicago, Ill

125. 95117927 CA: 95(14)117927k CONFERENCE PROCEEDING
PEATGAS process development status
AUTHOR: Punwani, D. V.; Biljetina, R.
LOCATION: Inst. Gas Technol., Chicago, IL, USA
JOURNAL: Peat Energy Alternative, Symp. Pap. EDITOR: White, Jack W. (Ed); Feingold, Bonnie F. (Ed); McGrew, Wilma (Ed)
DATE: 1980 PAGES: 355-75 CODEN: 46AQA8 LANGUAGE: English PUBLISHER: IGT, Chicago, Ill

126. 95065056 CA: 95(8)65056d PATENT
Method and apparatus for producing gas
INVENTOR(AUTHOR): Bruun, Bjoern
LOCATION: Den.
ASSIGNEE: B. og W. Alpha Diesel
PATENT: PCT International; WO 8101010 DATE: 810416
APPLICATION: Denmark; DK 794123 DATE: 791002
PAGES: 9 pp. CODEN: PIXXD2 LANGUAGE: English
CLASS: C10J-003/30, C10B-031/00

127. 95065044 CA: 95(8)65044y PATENT
Manufacturing coal briquets
LOCATION: Japan
ASSIGNEE: Suzuki Shokai K. K.
PATENT: Japan Kokai Tokkyo Koho; JP 8145991 DATE: 810425
APPLICATION: Japan; JP 79122797 DATE: 790925
PAGES: 3 pp. CODEN: JKXXAF LANGUAGE: Japanese
CLASS: C10L-009/10, C10L-005/02

128. 95027721 CA: 95(4)27721j PATENT
Synthetic hydrocarbon fuels from peat
INVENTOR(AUTHOR): Weil, Sanford A.; Punwani, Dharamvir; Bodle, William W.
LOCATION: USA
ASSIGNEE: Institute of Gas Technology
PATENT: United States; US 4263125 DATE: 810421
APPLICATION: United States; US 59131 DATE: 790720
PAGES: 7 pp. CODEN: USXXAM LANGUAGE: English
CLASS: 208008000R, C10G-001/00, C07C-029/16, C07C-027/06, C10B-047/00

129. 95009690 CA: 95(2)9690u JOURNAL
Formation of deposits on boiler convective heating surfaces in the combined combustion of peat and petroleum distillation residue
AUTHOR: Baryshev, V. I.; Gol'din, G. N.; Tyl'chevskaya, L. I.
LOCATION: Beloruss. Filial, Energ. Inst. im. Krzhizhanovskogo, Minsk, USSR
JOURNAL: Elektr. Sta. DATE: 1981 NUMBER: 2 PAGES: 21-3 CODEN: EKSTAP ISSN: 0013-5372 LANGUAGE: Russian

130. 94197274 CA: 94(24)197274n PATENT
Treating spent pulping liquor in a fluidized bed reactor
INVENTOR(AUTHOR): Nieminen, Jorma J.; Engstroem, Folke
LOCATION: Finland
ASSIGNEE: Ahlstrom, A., Oy
PATENT: United States; US 4244779 DATE: 810113
APPLICATION: Finland; FI 762695 DATE: 760922
PAGES: 15 pp. Cont-in-part of U.S. Ser. No. 820,575, abandoned. CODEN: USXXAM LANGUAGE: English CLASS: 162030000R, D21C-011/12

131. 94194755 CA: 94(24)194755j JOURNAL
Experimental investigation of peat hydrogasification
AUTHOR: Raniere, F. D.; Combs, L. P.; Falk, A. Y.
LOCATION: Energy Syst. Group, Rockwell Int., Canoga Park, CA, 91304, USA
JOURNAL: Prepr. Pap. - Am. Chem. Soc., Div. Fuel Chem. DATE: 1979 VOLUME: 24 NUMBER: 3 PAGES: 64-71
CODEN: ACFPAI ISSN: 0569-3772 LANGUAGE: English

132. 94177869 CA: 94(22)177869g PATENT
Method of and apparatus for heat processing of pulverized solid fuel
INVENTOR(AUTHOR): Chukhanov, Z. F.; Chukhanov, Z. Z.; Tsuprov, S. A.; Bratchenko, B. F.; Lyashenko, I. V.; Karesev, V. A.; Nikolaev, A. M.; Shibaev, R. M.
LOCATION: USSR
ASSIGNEE: Krzhizhanovskii, G. M., Power Engineering Institute
PATENT: Britain UK Pat. Appl.; GB 2045275 DATE: 801029
APPLICATION: Britain; GB 7910533 DATE: 790326
PAGES: 8 pp. CODEN: BAXXDU LANGUAGE: English
CLASS: C10B-049/12, C10B-053/04, C10B-057/02

133. 94177855 CA: 94(22)177855z PATENT
Manufacturing fuel slurries containing dewatered low-grade coal and hydrocarbon oil
LOCATION: Japan
ASSIGNEE: Mitsui Mining Co., Ltd.; Mitsui Coke Co., Ltd.
PATENT: Japan Kokai Tokkyo Koho; JP 8116588 DATE: 810217
APPLICATION: Japan; JP 7991662 DATE: 790720
PAGES: 5 pp. CODEN: JKXXAF LANGUAGE: Japanese
CLASS: C10G-001/04

134. 95153672 CA: 95(18)153672g PATENT
Energy from solid carbonaceous fuels
INVENTOR(AUTHOR): Rekant, Uriel
LOCATION: Israel
PATENT: Israel; IL 54214 DATE: 810331
APPLICATION: Israel; IL 54214 DATE: 780307
PAGES: 16 pp. CODEN: ISXXAQ LANGUAGE: English
CLASS: C10J-003/06, F23C-009/00

135. 95153520 CA: 95(18)153520f CONFERENCE PROCEEDING
Electrochemical gasification of peat
AUTHOR: Coughlin, Robert W.; Farooque, M.
LOCATION: Dep. Chem. Eng., Univ. Connecticut, Storrs, CT, 06268, USA
JOURNAL: Peat Energy Alternative, Symp. Pap. EDITOR: White, Jack W. (Ed); Feingold, Bonnie F. (Ed); McGrew, Wilma (Ed)
DATE: 1980 PAGES: 439-58 CODEN: 46AQA8 LANGUAGE: English PUBLISHER: IGT, Chicago, Ill

136. 95153519 CA: 95(18)153519n CONFERENCE PROCEEDING
The development of peat-oil and peat-methanol slurries for combustion
AUTHOR: Clemens, Donald F.; Evans, George O., II; Whitehurst, Brooks M.
LOCATION: Dep. Chem., East Carolina Univ., Greenville, NC, 27834, USA
JOURNAL: Peat Energy Alternative, Symp. Pap. EDITOR: White, Jack W. (Ed); Feingold, Bonnie F. (Ed); McGrew, Wilma (Ed)
DATE: 1980 PAGES: 337-46 CODEN: 46AQA8 LANGUAGE: English PUBLISHER: IGT, Chicago, Ill

137. 95118300 CA: 95(14)118300n JOURNAL
A new synthesis gas process for biomass and peat
AUTHOR: Lindman, N.; Engstroem, S.; Rensfelt, E.; Waldheim, L.
LOCATION: R. Inst. Technol., S-100 44, Stockholm, Swed.
JOURNAL: Energy Biomass Wastes DATE: 1981 VOLUME: 5th, PAGES: 571-611 CODEN: EBWADU LANGUAGE: English

138. 95118129 CA: 95(14)118129p CONFERENCE PROCEEDING
The primary conversion of peat via direct hydrogenolysis using syngas and pyrolysis under reduced pressure
AUTHOR: Chornet, Esteban; Roy, Christian
LOCATION: Dep. Chem. Eng., Univ. Sherbrooke, Sherbrooke, PQ, Can., J1K 2R1
JOURNAL: Peat Energy Alternative, Symp. Pap. EDITOR: White, Jack W. (Ed); Feingold, Bonnie F. (Ed); McGrew, Wilma (Ed)
DATE: 1980 PAGES: 555-80 CODEN: 46AQA8 LANGUAGE: English PUBLISHER: IGT, Chicago, Ill

139. 95118127 CA: 95(14)118127m CONFERENCE PROCEEDING
Conversion of Hula peat to oil and gas
AUTHOR: Ikan, R.; Ginzburg, V.; Ioselis, P.; Hoffer, D.; Brenner, S.; Klein, J.
LOCATION: Dep. Org. Chem., Hebrew Univ., Jerusalem, Israel
JOURNAL: Peat Energy Alternative, Symp. Pap. EDITOR: White, Jack W. (Ed); Feingold, Bonnie F. (Ed); McGrew, Wilma (Ed)
DATE: 1980 PAGES: 519-24 CODEN: 46AQA8 LANGUAGE: English PUBLISHER: IGT, Chicago, Ill

140. 95118126 CA: 95(14)118126k CONFERENCE PROCEEDING
Simultaneous liquefaction and dewatering of peat in Sweden
AUTHOR: Bjoernbom, E.; Bjoernbom, P.; Granath, L.; Hoernell, C.; Karlsson, G.
LOCATION: Dep. Chem. Technol., R. Inst. Technol., S-100 44, Stockholm, Swed.
JOURNAL: Peat Energy Alternative, Symp. Pap. EDITOR: White, Jack W. (Ed); Feingold, Bonnie F. (Ed); McGrew, Wilma (Ed)
DATE: 1980 PAGES: 507-18 CODEN: 46AQA8 LANGUAGE: English PUBLISHER: IGT, Chicago, Ill

141. 95118123 CA: 95(14)118123g CONFERENCE PROCEEDING
The CS/R advanced peat hydrogasification process
AUTHOR: Sprouse, Kenneth M.; Rosemary, Jack K.; Friedman, Joseph
LOCATION: Energy Syst. Group, Rockwell Int., Canoga Park, CA, 91304, USA
JOURNAL: Peat Energy Alternative, Symp. Pap. EDITOR: White, Jack W. (Ed); Feingold, Bonnie F. (Ed); McGrew, Wilma (Ed)
DATE: 1980 PAGES: 377-414 CODEN: 46AQA8 LANGUAGE: English PUBLISHER: IGT, Chicago, Ill

142. 95118122 CA: 95(14)118122f CONFERENCE PROCEEDING
Pilot plant tests of peat for direct combustion in utility boilers
AUTHOR: Honea, F. I.; Sears, D. R.; Talty, R. D.
LOCATION: Grand Forks Energy Technol. Cent., Grand Forks, ND, 58201, USA
JOURNAL: Peat Energy Alternative, Symp. Pap. EDITOR: White, Jack W. (Ed); Feingold, Bonnie F. (Ed); McGrew, Wilma (Ed)
DATE: 1980 PAGES: 313-36 CODEN: 46AQA8 LANGUAGE: English PUBLISHER: IGT, Chicago, Ill

143. 95222639 CA: 95(26)222639r JOURNAL
Peat char gasification - laboratory and PDU-scale studies
AUTHOR: Punwani, D. V.; Weil, S. A.; Pyrcioch, E. J.; Nandi, S. P.
LOCATION: Inst. Gas Technol., Chicago, IL, USA
JOURNAL: J. Energy DATE: 1981 VOLUME: 5 NUMBER: 5 PAGES: 276-80 CODEN: JENED5 ISSN: 0146-0412 LANGUAGE: English

144. 95222638 CA: 95(26)222638q JOURNAL
Peat bogs offer a reliable, local source of fuel in several states
AUTHOR: Punwani, D. V.
LOCATION: Inst. Gas Technol., USA
JOURNAL: Power DATE: 1981 VOLUME: 125 NUMBER: 10 PAGES: 106-9 CODEN: POWEAD ISSN: 0032-5929 LANGUAGE: English

145. 95222429 CA: 95(26)222429x JOURNAL
Gasification technology. Part 1. Theory and fuel types
AUTHOR: Svensson, Owe
LOCATION: EnerChem AB, Lund, Swed.
JOURNAL: Kem. Tidskr. DATE: 1981 VOLUME: 93 NUMBER: 11 PAGES: 40-2, 44, 47-8 CODEN: KETIAL ISSN: 0039-6605 LANGUAGE: Swedish

146. 95221658 CA: 95(26)221658j JOURNAL
Development of fluid bed combustion applicable to the sugarcane industry
AUTHOR: Hunt, G. W.
LOCATION: Energy Equipment Co. (Pty.) Ltd., S. Afr.
JOURNAL: Proc. Annu. Congr. - S. Afr. Sugar Technol. Assoc. DATE: 1981 VOLUME: 55, PAGES: 31-6 CODEN: PSATAA ISSN: 0370-1816 LANGUAGE: English

147. 95206614 CA: 95(24)206614y PATENT
Combined production of electrical energy and fuel from peat
INVENTOR(AUTHOR): Collin, Per Harald
LOCATION: Swed.
ASSIGNEE: Stora Kopparbergs Bergslags AB
PATENT: PCT International; WO 8102303 DATE: 810820
APPLICATION: Sweden; SE 801272 DATE: 800218
PAGES: 16 pp. CODEN: PIXXD2 LANGUAGE: English
CLASS: C10F-005/00, C10J-003/00, F02B-043/08, F02C-003/20

148. 95189824 CA: 95(22)189824x JOURNAL
Combustion of peat in a fluidized bed
AUTHOR: Hampartsoumian, E.; Gibbs, B. M.
LOCATION: Dep. Fuel Energy, Univ. Leeds, Leeds, Engl.
JOURNAL: Inst. Energy Symp. Ser. (London) DATE: 1980 VOLUME: 4 NUMBER: Fluid. Combust.: Syst. Appl. PAGES: IIB/3/1-IIB/3/9 CODEN: IESSDR LANGUAGE: English

149. 95172367 CA: 95(20)172367c JOURNAL
The influence of fuel nitrogen and volatiles content on the nitric oxide emission from the fluidized combustion of solid fuels
AUTHOR: Gibbs, B. M.; Hampartsoumian, E.
LOCATION: Dep. Fuel Energy, Univ. Leeds, Leeds, Engl.
JOURNAL: Inst. Energy Symp. Ser. (London) DATE: 1980 VOLUME: 4 NUMBER: Fluid. Combust.: Syst. Appl. PAGES: V/2/1-V/2/7 CODEN: IESSDR LANGUAGE: English

150. 95172359 CA: 95(20)172359b JOURNAL
Historical look at creating gas from peat during the 300 years between 1650 and 1950
AUTHOR: Richard, Karl Hinrich
LOCATION: D-2870, Delmenhorst, Fed. Rep. Ger.
JOURNAL: Telma (Hannover) DATE: 1979 VOLUME: 9, PAGES: 109-40 CODEN: TELMDR ISSN: 0340-4927 LANGUAGE: German

151. 95172358 CA: 95(20)172358a JOURNAL
Possible contribution of peat gasification to the future supply of synthesis gas (SNG = substitute natural gas) to meet the energy and raw materials needs
AUTHOR: Grumpelt, Heinrich
LOCATION: C. Deilmann A.-G., D-444, Bentheim, Fed. Rep. Ger.
JOURNAL: Telma (Hannover) DATE: 1979 VOLUME: 9, PAGES: 87-108 CODEN: TELMDR ISSN: 0340-4927 LANGUAGE: German

152. 95153735 CA: 95(18)153735e JOURNAL
Production of liquid fuels from biomass by the HYFLEX process
AUTHOR: Duncan, Dennis A.; Bodle, William W.; Banerjee, Dhirendra P.
LOCATION: Inst. Gas Technol., Chicago, IL, 60616, USA
JOURNAL: Energy Biomass Wastes DATE: 1981 VOLUME: 5th, PAGES: 917-38 CODEN: EBWADU LANGUAGE: English

153. 96011004 CA: 96(2)11004n CONFERENCE PROCEEDING
Analysis and assessment of PAH from coal combustion and gasification
AUTHOR: Nichols, Duane G.; Gangwal, Santosh K.; Sparacino, Charles M.
LOCATION: Research Triangle Inst., Research Triangle Park, NC, 27709, USA
JOURNAL: Chem. Anal. and Biol. Fate: Polynucl. Aromat. Hydrocarbons, Int. Symp., 5th EDITOR: Cooke, Marcus (Ed); Dennis, Anthony J (Ed) DATE: 1981 PAGES: 397-406
CODEN: 460JAN LANGUAGE: English MEETING DATE: 800000
PUBLISHER: Battelle Press, Columbus, Ohio

154. 96008984 CA: 96(2)8984b TECHNICAL REPORT
Feedstock characteristics and preparation for peat gasification
AUTHOR: Punwani, D. V.; Aspinall, F.; Lofton, S. M.
LOCATION: Inst. Gas Technol., Chicago, IL, USA
JOURNAL: Report DATE: 1981 NUMBER: GRI-79/0092; Order No. PB81-222275 PAGES: 333 pp. CODEN: D8REP4
LANGUAGE: English CITATION: Gov. Rep. Announce. Index (U. S.) 1981, 81(22), 4683 AVAIL: NTIS

DIALOG File311: CA SEARCH 1982-83 UD=09808 (Copr. 1983 by the Amer. Chem. Soc.) (Item 20 of 31) User 8716 28feb83 460

155. 96106931 CA: 96(14)106931b JOURNAL
Fixed-bed gasification of domestic fuels. Experiments with peat
AUTHOR: Wilen, Carl; Jantunen, Markku; Asplund, Dan .
LOCATION: Finland
JOURNAL: Tutkimuksia - Valt. Tek. Tutkimuskeskus DATE: 1981 VOLUME: 36, PAGES: 29 pp. CODEN: TUTUDX LANGUAGE: Finnish

156. 96106930 CA: 96(14)106930a JOURNAL
Fixed-bed gasification of domestic fuels. Properties of gas and use in diesel engines
AUTHOR: Jantunen, Markku; Asplund, Dan
LOCATION: Finland
JOURNAL: Tutkimuksia - Valt. Tek. Tutkimuskeskus DATE: 1981 VOLUME: 37, PAGES: 32 pp. CODEN: TUTUDX LANGUAGE: Finnish

157. 96106923 CA: 96(14)106923a JOURNAL
Liquefaction of peat in aqueous reaction solutions under pressure
AUTHOR: Bjarnason, Jonas; Nguyen Huu Uy; Oelert, Hans Henning
LOCATION: Islands Univ., Sudurgata, Iceland
JOURNAL: Telma (Hannover) DATE: 1981 VOLUME: 11, PAGES: 97-110 CODEN: TELMDR ISSN: 0340-4927 LANGUAGE: German

158. 96071576 CA: 96(10)71576k TECHNICAL REPORT
Peat biogasification development program
Minnesota Gas Co.
LOCATION: Minneapolis, MN, USA
JOURNAL: Report DATE: 1981 NUMBER: DOE/ET/14696-T6; Order No. DE81028299 PAGES: 240 pp. CODEN: D3REP3 LANGUAGE: English CITATION: Energy Res. Abstr. 1981, 6(22), Abstr. No. 33081 AVAIL: NTIS

159. 96071382 CA: 96(10)71382u JOURNAL
Synthetic natural gas from peat
AUTHOR: Rader, A. M.
LOCATION: Minnesota Gas Co., Minneapolis, MN, USA
JOURNAL: Technol. Use Lignite DATE: 1980 PAGES: 335-50 CODEN: TULIDP ISSN: 0276-1777 LANGUAGE: English MEETING DATE: 790000

160. 96055115 CA: 96(8)55115d JOURNAL
Results of studies of the properties of ash deposits in different Tyumen peat combustion processes
AUTHOR: Belov, S. Yu.; Rundygin, Yu. A.; Khrenov, G. V.; Prikk, A.
LOCATION: USSR
JOURNAL: Tr. Tallin. Politekhn. In-ta DATE: 1981 NUMBER: 501 PAGES: 27-37 CODEN: D3RAPP LANGUAGE: Russian CITATION: Ref. Zh., Teploenerg. 1981, Abstr. No. 11R39

161. 96040196 CA: 96(6)40196g JOURNAL
Heavy-metal accumulation in the moss Pleurozium schreberi in the surroundings of two peat-fired power plants in Finland
AUTHOR: Folkeson, Lennart
LOCATION: Dep. Plant Ecol., Univ. Lund, S-223 61, Lund, Swed.
JOURNAL: Ann. Bot. Fenn. DATE: 1981 VOLUME: 18 NUMBER: 3 PAGES: 245-53 CODEN: ABOFAQ ISSN: 0003-3847 LANGUAGE: English

162. 96021869 CA: 96(4)21869n JOURNAL
Study of the strength of frontal deposits during combustion of solid fuels with a high calcium oxide content in ash
AUTHOR: Baryshev, V. I.
LOCATION: Beloruss. Filial, Energ. Inst. im. Krzhizhauovskaogo, Moscow, USSR
JOURNAL: Elektr. Stn. DATE: 1981 NUMBER: 9 PAGES: 19-21 CODEN: EKSTAP ISSN: 0013-5372 LANGUAGE: Russian

163. 96021661 CA: 96(4)21661p JOURNAL
Experience with a fluid bed test rig - results from commissioning tests on a hot gas generator
AUTHOR: Pritchard, A. B.; Caplin, P. B.
LOCATION: Energy Equip. Co., UK, LU7 8HE
JOURNAL: Inst. Energy Symp. Ser. (London) DATE: 1980 VOLUME: 4 NUMBER: Fluid. Combust.: Syst. Appl. PAGES: IIB/4/1-IB/4/11 CODEN: IESSDR LANGUAGE: English

164. 96011349 CA: 96(2)11349d TECHNICAL REPORT
Environmental aspects of alternative wet technologies for producing energy/fuel from peat
AUTHOR: Smith, R. T.
LOCATION: Energy Resour. Co., Inc., Walnut Creek, CA, USA
JOURNAL: Report DATE: 1981 NUMBER: DOE/FC/10169-T1 PAGES: 142 pp. CODEN: D3REP3 LANGUAGE: English CITATION: Energy Res. Abstr. 1981, 6(15), Abstr. No. 21556 AVAIL: NTIS

165. 97075495 CA: 97(10)75495b PATENT
Synthetic hydrocarbon fuels from peat
INVENTOR(AUTHOR): Weil, Sanford A.; Punwani, Dharamvir; Bodle, William W.
LOCATION: USA
ASSIGNEE: Institute of Gas Technology
PATENT: United States ; US 4336125 A DATE: 820622
APPLICATION: US 241386 (810306); *US 59131 (790720)
PAGES: 9 pp. Cont.-in-part of U.S. 4,263,125. CODEN: USXXAM LANGUAGE: English CLASS: 208008000R, C10G-001/00, C10B-047/00, C10B-051/00, C10B-047/24

166. 97058521 CA: 97(8)58521q CONFERENCE PROCEEDING
An evaluation of MHD coal cycles with tail gasification of coal and oxygen as oxidizer
AUTHOR: Braun, J.; Pudlik, W.
LOCATION: Studsvik Energitek. AB, S-611 82, Nykoeping, Swed.
JOURNAL: Int. Conf. MHD Electr. Power Gener., (Proc.), 7th
EDITOR: Dawson, Alberta M. (Ed); Overlan, Dianne (Ed)
DATE: 1981 VOLUME: 2, PAGES: 828-37 CODEN: 47YXAK
LANGUAGE: English MEETING DATE: 800000 PUBLISHER: Mass. Inst. Technol., Cambridge, Mass

167. 97058498 CA: 97(8)58498n JOURNAL
Unconventional energy - for a public power utility
AUTHOR: Leber, R. E.
LOCATION: American Public Power Assoc., Washington, DC, USA
JOURNAL: Mech. Eng. DATE: 1982 VOLUME: 104 NUMBER: 1
PAGES: 36-44 CODEN: MEENAH ISSN: 0025-6501 LANGUAGE: English

168. 97058433 CA: 97(8)58433n PATENT
Fixed bed pressure gasification of lignite
INVENTOR(AUTHOR): Hauptmann, Werner; Seifert, Guenter; Scholz, Guenter
LOCATION: Ger. Dem. Rep.
PATENT: Germany (East) ; DD 151958 Z DATE: 811111
APPLICATION: DD 222436 (800707)
PAGES: 16 pp. CODEN: GEXXA8 LANGUAGE: German
CLASS: C10J-003/06

169. 97058285 CA: 97(8)58285r JOURNAL
Production of liquid fuels from milled peat via gas-phase hydrogenation
AUTHOR: Solantausta, Yrjo; Arpiainen, Vesa; Asplund, Dan; Jarvelainen, Martti
LOCATION: Poltto Voiteluaine-Lab., Valtion Tek. Tutkimuskeskus, Espoo, Finland
JOURNAL: Kem. - Kemi DATE: 1982 VOLUME: 9 NUMBER: 3
PAGES: 167-70 CODEN: KMKMAA ISSN: 0355-1628 LANGUAGE: Finnish

170. 97041230 CA: 97(6)41230w TECHNICAL REPORT
Gasification of milled peat in fluidized bed
AUTHOR: Salo, K.; Filen, H.; Asplund, D.
LOCATION: Poltto- Voiteluainelab., Valt. Tek. Tutkimuskeskus, Espoo, Finland
JOURNAL: Report DATE: 1980 NUMBER: VIT-POV-28; Order No. DE82901148 PAGES: 66 pp. CODEN: D3REP3 LANGUAGE: Finnish CITATION: Energy Res. Abstr. 1982, 7(6), Abstr. No. 13641 AVAIL: NTIS (U.S. Sales Only)

171. 97008893 CA: 97(2)8893s TECHNICAL REPORT
Comparative analysis of peat gasification reactor configuration
UOP Inc.
LOCATION: McLean, VA, USA
JOURNAL: Report DATE: 1981 NUMBER: DOE/ET/10159-T8; Order No. DE82001067 PAGES: 59 pp. CODEN: D3REP3
LANGUAGE: English CITATION: Energy Res. Abstr. 1982, 7(5), Abstr. No. 10136 AVAIL: NTIS

172. 96165440 CA: 96(20)165440p PATENT
Conversion of coal, peat or wood into gaseous hydrocarbons or volatile distillates
INVENTOR(AUTHOR): Swanson, Rollan
LOCATION: USA
PATENT: Brazil Pedido ; BR 8102312 A DATE: 811208
APPLICATION: BR 812312 (810414); *US 140604 (800415); *US 222021 (810105)
PAGES: 45 pp. CODEN: BPXXDX LANGUAGE: Portuguese
CLASS: C10G-001/00, C10J-003/06

173. 96106932 CA: 96(14)106932c JOURNAL
Fixed-bed gasification of domestic fuels. Theory
AUTHOR: Jantunen, Markku; Asplund, Dan
LOCATION: Poltto- ja Voiteluainelab., Tech. Res. Cent. Finland, Espoo, Finland
JOURNAL: Tutkimuksia - Valt. Tek. Tutkimuskeskus DATE: 1981
VOLUME: 35, PAGES: 38 pp. CODEN: TUTUDX LANGUAGE: Finnish

174. 97219446 CA: 97(26)219446m PATENT
Gasification of carbon-containing material
INVENTOR(AUTHOR): Rekant, Uriel
LOCATION: Israel
PATENT: Germany Offen. ; DE 3102981 A1 DATE: 820902
APPLICATION: DE 3102981 (810129)
PAGES: 29 pp. CODEN: GWXXBX LANGUAGE: German
CLASS: C10J-003/30

175. 97165823 CA: 97(20)165823m JOURNAL
PEATGAS pilot plant operating results
AUTHOR: Biljetina, R.; Punwani, D.
LOCATION: Inst. Gas Technol., USA
JOURNAL: Proc. Intersoc. Energy Convers. Eng. Conf. DATE: 1982 VOLUME: 17th NUMBER: Vol. 2 PAGES: 820-4
CODEN: PIECDE ISSN: 0146-955X LANGUAGE: English

176. 97165778 CA: 97(20)165778a JOURNAL
Startup and operation of the Kauttua 200,000 lbs of steam per hour cogeneration Ahlstrom circulating fluidized bed combustion
AUTHOR: Kelly, Andrew J.; Engstrom, Folke
LOCATION: Pyropower Corp., San Diego, CA, USA
JOURNAL: Coal Technol. (Houston) DATE: 1981 VOLUME: 4th NUMBER: Vol. 5 PAGES: 7-14 CODEN: COATDC ISSN: 0270-3661 LANGUAGE: English

177. 97147389 CA: 97(18)147389v JOURNAL
Single-stage fluidized-bed gasification of peat
AUTHOR: Rue, David M.; Lau, Francis S.; Weil, Sanford A.; Punwani, Dharam V.
LOCATION: IIT Cent., Inst. Gas Technol., Chicago, IL, 60616, USA
JOURNAL: Proc. Intersoc. Energy Convers. Eng. Conf. DATE: 1982 VOLUME: 17th NUMBER: Vol. 2 PAGES: 880-5
CODEN: PIECDE ISSN: 0146-955X LANGUAGE: English

178. 97095289 CA: 97(12)95289r CONFERENCE PROCEEDING
Comparative analysis of peat gasification reactor configurations
AUTHOR: Kuo, Dan M.
LOCATION: Syst. Dev. Corp., UOP, Inc., McLean, VA, USA
JOURNAL: Proc. U.S. Dep. Energy Tech. Contract. Conf. Peat, 1st DATE: 1980 NUMBER: TR-80/031-001 PAGES: 223-45
CODEN: 48DYAR LANGUAGE: English PUBLISHER: NTIS, Springfield, Va

179. 97095288 CA: 97(12)95288q CONFERENCE PROCEEDING
Peat gasification: Rockwell International process
AUTHOR: Friedman, Joseph
LOCATION: Rockwell Int., Canoga Park, CA, USA
JOURNAL: Proc. U.S. Dep. Energy Tech. Contract. Conf. Peat, 1st DATE: 1980 NUMBER: TR-80/031-001 PAGES: 195-222
CODEN: 48DYAR LANGUAGE: English PUBLISHER: NTIS, Springfield, Va

180. 97095287 CA: 97(12)95287p CONFERENCE PROCEEDING
Peat gasification: low-severity hydropyrolysis
AUTHOR: Punwani, Dharam V.
LOCATION: Inst. Gas Technol., Chicago, IL, USA
JOURNAL: Proc. U.S. Dep. Energy Tech. Contract. Conf. Peat, 1st DATE: 1980 NUMBER: TR-80/031-001 PAGES: 183-93
CODEN: 48DYAR LANGUAGE: English PUBLISHER: NTIS, Springfield, Va

181. 97095286 CA: 97(12)95286n CONFERENCE PROCEEDING
Peat dewatering: solvent extraction
AUTHOR: Punwani, Dharam V.
LOCATION: Inst. Gas Technol., Chicago, IL, USA
JOURNAL: Proc. U.S. Dep. Energy Tech. Contract. Conf. Peat, 1st DATE: 1980 NUMBER: TR-80/031-001 PAGES: 167-81
CODEN: 48DYAR LANGUAGE: English PUBLISHER: NTIS, Springfield, Va

182. 97095285 CA: 97(12)95285m CONFERENCE PROCEEDING
Peat pretreatment: high-pressure wet carbonization
AUTHOR: Punwani, Dharam V.
LOCATION: Inst. Gas Technol., Chicago, IL, USA
JOURNAL: Proc. U.S. Dep. Energy Tech. Contract. Conf. Peat, 1st DATE: 1980 NUMBER: TR-80/031-001 PAGES: 145-65
CODEN: 48DYAR LANGUAGE: English PUBLISHER: NTIS, Springfield, Va

183. 97095242 CA: 97(12)95242v JOURNAL
Behavior of sulfur and calcium oxide in brown coals and peat during laboratory combustion
AUTHOR: Baryshev, V. I.; Shpilevskaya, L. I.
LOCATION: Energ. Inst., Minsk, USSR
JOURNAL: Teploenergetika (Moscow) DATE: 1982 NUMBER: 7 PAGES: 40-2 CODEN: TPLOA5 ISSN: 0040-3636 LANGUAGE: Russian

184. 612705 FE-2469-8
Experimental Program for the Development of Peat Gasification. Supplemetary Report No. 1
Institute of Gas Technology, Chicago, Ill.
Corp. Source Codes: 9500656
Sponsor: Energy Research and Development Administration.
Apr 77 128p
NTIS Prices: PC A07

185. 603431 FE-2469-3
Experimental Program for the Development of Peat Gasification. Interim Report No. 1, February 10--June 30, 1976
Institute of Gas Technology, Chicago, Ill.
Corp. Source Codes: 9500656
Sponsor: Energy Research and Development Administration.
1976 21p
NTIS Prices: PC A02/MF A01

186. 537087 ERDA-tr-120
Storage of Solid Fuel at Dumps of Thermoelectric Power Stations of the USSR, Methods of Preventing Dusting and Spontaneous Combustion of Fuel in Piles
1975 12p
Translation of Khranenie tverdogo topliva na skladakh teplovykh elektrostantsii SSSR, sposoby predotvrashcheniya pyleniya, a akzhe samovozgoraniya topliva v shtabelyakh.
Document Type: Translation
NTIS Prices: PC A02/MF A01

187. 458970 AD-A012 970
Analysis of Energy Resources and Programs of the Soviet Union and Eastern Europe. Appendix A: Framework of Energy Supply and Demand
(Final rept. Feb-Dec 73 (Appendix A))
Hopkins, George D. ; Korens, Nick ; Schmidt, Richard A. ; Trexel, Jr, Carl A.
Stanford Research Inst Menlo Park Calif
Corp. Source Codes: 332500
Sponsor: Rome Air Development Center, Griffiss AFB, N.Y.; Defense Advanced Research Projects Agency, Arlington, Va.
Report No.: RADCTR-74-204-App-A
Dec 73 232p
See also Appendix D, AD-A012 971.
NTIS Prices: PC A11/MF A01

188. 655916 FE-2518-16
Hydrogasifier Development for the Hydrane Process. Monthly Progress Report, February 1978
Combs, L. P. ; Greene, M. I.
Rockwell International Corp., Canoga Park, Calif. Rocketdyne Div.
Corp. Source Codes: 9502566
Sponsor: Department of Energy.
Mar 78 27p
NTIS Prices: PC A03/MF A01

189. 655915 FE-2518-15
Hydrogasifier Development for the Hydrane Process. Monthly Progress Report, January 1978
Combs, L. P. ; Greene, M. I.
Rocketdyne, Canoga Park, Calif.
Corp. Source Codes: 5550000
Sponsor: Department of Energy.
8 Feb 78 47p
NTIS Prices: PC A03/MF A01

190. 652373 FE-2469-23
Experimental Program for the Development of Peat Gasification. Monthly Status Report, January 1--January 31, 1978
Institute of Gas Technology, Chicago, Ill.
Corp. Source Codes: 9500656
Sponsor: Department of Energy.
1978 22p
NTIS Prices: PC A02/MF A01

191. 646657 PB-279 196
Technical Manual for the Analysis of Fuels
(Final rept. Dec 76-Dec 77)
Davidson, L. N. ; Lyman, W. J. ; Shooter, D. ; Valentine, J. R.
Little (Arthur D.), Inc., Cambridge, Mass.
Sponsor: Industrial Environmental Research Lab., Research Triangle Park, N.C.
Report No.: EPA/600/777/143
Dec 77 140p
See also report dated Apr 76, PB-256 696.
NTIS Prices: PC A07/MF A01

192. 645927 FE-2469-19
Experimental Program for the Development of Peat Gasification. Monthly Status Report, September 1--September 30, 1977
Institute of Gas Technology, Chicago, Ill.
Corp. Source Codes: 9500656
Sponsor: Department of Energy.
1977 10p
NTIS Prices: PC A02/MF A01

193. 645926 FE-2469-18
Experimental Program for the Development of Peat Gasification. Monthly Status Report, August 1--August 31, 1977
Institute of Gas Technology, Chicago, Ill.
Corp. Source Codes: 9500656
Sponsor: Department of Energy.
1977 17p
NTIS Prices: PC A02/MF A01

194. 645925 FE-2469-16
Experimental Program for the Development of Peat Gasification. Monthly Status Report, July 1--July 31, 1977
Institute of Gas Technology, Chicago, Ill.
Corp. Source Codes: 9500656
Sponsor: Department of Energy.
1977 17p
NTIS Prices: PC A02/MF A01

195. 643200 CONF-771092-3
Peat Gasification for SNG Production
Punwani, D. V. ; Rader, A. M.
Science Applications, Inc., Huntsville, Ala.
Corp. Source Codes: 9500066
Sponsor: Department of Energy.
1977 30p
Synthetic pipeline gas symposium, Chicago, IL, USA, 31 Oct 1977.
Document Type: Conference proceeding
NTIS Prices: PC A03/MF A01

196. 616924 FE-2469-10
Experimental Program for the Development of Peat Gasification. Interim Report No. 2. Thermobalance Studies
Institute of Gas Technology, Chicago, Ill.
Corp. Source Codes: 9500656
Sponsor: Energy Research and Development Administration.
Apr 77 52p
NTIS Prices: PC A04/MF A01

197. 688063 FE-2469-25
Experimental Program for the Development of Peat Gasification. Interim Report No. 4. Physical Properties Evaluation: Task 1
Institute of Gas Technology, Chicago, IL.
Corp. Source Codes: 9500656
Sponsor: Department of Energy.
Apr 78 72p
Languages: English
NTIS Prices: PC A04/MF A01

198. 685909 NP-23271
Gasification of Peat: A Literature Review
Leppaemaeki, E. ; Asplund, D. ; Ekman, E.
Valtion Teknillinen Tutkimuskeskus, Helsinki (Finland).
Corp. Source Codes: 6658400
Dec 76 56p
U.S. Sales Only.
Languages: English
NTIS Prices: PC A04/MF A01

199. 685563 FE-2518-12
Hydrogasifier Development for the Hydrane Process. Third Quarter Report, September--November 1977
Combs, L. P. ; Greene, M. I.
Rocketdyne, Canoga Park, CA.
Corp. Source Codes: 5550000
Sponsor: Department of Energy.
Mar 78 71p
Languages: English
NTIS Prices: PC A04/MF A01

200. 685318 CONF-780902-8
Peat Hydrogasification
Weil, S. A. ; Nandi, S. P. ; Punwani, D. V. ; Kopstein, M. J.
Institute of Gas Technology, Chicago, IL.
Corp. Source Codes: 9500656
Sponsor: Department of Energy.
1978 13p
American Chemical Society meeting, Miami, FL, USA, 10 Sep 1978.
Languages: English Document Type: Conference proceeding
NTIS Prices: PC A02/MF A01

201. 685286 CONF-780611-8
Peat Gasification: An Experimental Study
Punwani, D. V. ; Nandi, S. P. ; Gavin, L. W. ; Johnson, J. L.
Institute of Gas Technology, Chicago, IL.
Corp. Source Codes: 9500656
Sponsor: Department of Energy.
1978 34p
AIChE symposium, Philadelphia, PA, USA, 4 Jun 1978.
Languages: English Document Type: Conference proceeding
NTIS Prices: PC A03/MF A01

202. 681100 FE-2469-27
Experimental Program for the Development of Peat Gasification. Monthly Status Report, April 1--April 30, 1978
Institute of Gas Technology, Chicago, IL.
Corp. Source Codes: 9500656
Sponsor: Department of Energy.
1978 18p
Languages: English
NTIS Prices: PC A02/MF A01

203. 677788 FE-2469-17
Experimental Program for the Development of Peat Gasification. Interim Report No. 3. Coiled Tube Reactor Experiments
Institute of Gas Technology, Chicago, Ill.
Corp. Source Codes: 9500656
Sponsor: Department of Energy.
Jan 78 46p
NTIS Prices: PC A03/MF A01

204. 664905 FE-2518-18
Hydrogasifier Development for the Hydrane Process
Combs, L. P. ; Greene, M. I.
Rocketdyne, Canoga Park, Calif.
Corp. Source Codes: 5550000
Sponsor: Department of Energy.
Apr 78 42p
NTIS Prices: PC A03/MF A01

205. 761154 CONF-790803-55
Synthetic Fuels from Peat Gasification
Punwani, D. V. ; Weil, S. A. ; Paganessi, J. E. ; Kopstein, M. J.
Institute of Gas Technology, Chicago, IL.
Corp. Source Codes: 013602000; 9500656
Sponsor: Department of Energy, Washington, DC.
1979 7p
14. intersociety energy conversion conference, Boston, MA, USA, 5 Aug 1979.
Languages: English Document Type: Conference proceeding
NTIS Prices: PC A02/MF A01

206. 746209 N80-11179
Combustion of Low Grade Coal
Morrison, G. F.
IEA Coal Research, London (England).
Report No.: ICTIS; ISBN-92-9029-016-1
Jun 78 90p
Languages: English
NTIS Prices: PC A05/MF A01

207. 743695 FE-2469-35
Experimental Program for the Development of Peat Gasification. Interim Report No. 6: Hydrogasification and Fluidized-Bed Tests as of September 30, 1978
Institute of Gas Technology, Chicago, IL.
Corp. Source Codes: 013602000; 9500656
Sponsor: Department of Energy.
Mar 79 100p
Languages: English
NTIS Prices: PC A05/MF A01

208. 733205 PB-299 277
Workshop Proceedings of Energy in Minnesota, Energy Technology Information for Decision Makers Held at Carleton College, Northfield, Minnesota on August 14-16, 1977
Minnesota Legislature Science and Technology Project, St. Paul.
Corp. Source Codes: 057078000
Sponsor: National Science Foundation, Washington, DC. Applied Science and Research Applications.
Report No.: NSF/RA770616
Aug 77 430p
Languages: English Document Type: Conference proceeding
NTIS Prices: PC A19/MF A01

209. 730472 FE-2469-34
Experimental Program for the Development of Peat Gasification. Interim Report No. 5: Process Design and Cost Estimates for a 250 Billion Btu/Day SNG from Peat Plant by He PEATGAS Process
Arora, J. L. ; Tsaros, C. L.
Institute of Gas Technology, Chicago, IL.
Corp. Source Codes: 9500656
Sponsor: Department of Energy.
Feb 79 107p
Languages: English
NTIS Prices: PC A06/MF A01

210. 727186 CONF-780891-1
SNG From Peat by the PEATGAS Process
Punwani, D. V. ; Arora, J. L. ; Tsaros, C. L.
Institute of Gas Technology, Chicago, IL.
Corp. Source Codes: 9500656
Sponsor: Department of Energy.
1978 19p
Annual international conference on coal gasification, liquefaction, and conversion to electricity, Pittsburgh, PA, USA, 1 Aug 1978.
Languages: English Document Type: Conference proceeding
NTIS Prices: PC A02/MF A01

211. 717876 FE-2518-17
Hydrogasifier Development for the Hydrane Process. Annual Report, March 1977--February 1978
Rockwell International, Canoga Park, CA. Rocketdyne Div.
Corp. Source Codes: 9502566
Sponsor: Department of Energy.
Jun 78 273p
Languages: English
NTIS Prices: PC A12/MF A01

212. 703557 CONF-781045-3
Status of the PEATGAS Process
Punwani, D. V.
Institute of Gas Technology, Chicago, IL.
Corp. Source Codes: 9500656
Sponsor: Department of Energy.
1978 29p
10. synthetic pipeline gas symposium, Chicago, IL, USA, 30 Oct 1978.
Languages: English Document Type: Conference proceeding
NTIS Prices: PC A03/MF A01

213. 786289 N80-26531
Demonstration Plant for Methanol Production from Domestic Raw Materials
Forskningsinstitutet foer Atomfysik, Stockholm (Sweden).
Corp. Source Codes: 069965000; F2280241
Sponsor: National Aeronautics and Space Administration, Washington, DC.
Report No.: NE-1979-5
1979 93p
Text in Swedish.
Languages: Swedish
NTIS Prices: PC A05/MF A01

214. 785519 CONF-800303-18
Peat Beneficiation and Its Effects on Dewatering and Gasification Characteristics
Mensinger, M. C. ; Weil, S. A. ; Punwani, D. V. ; Kopstein, M. J.
Institute of Gas Technology, Chicago, IL.
Corp. Source Codes: 013602000; 9500656
Sponsor: Department of Energy, Washington, DC.
1980 11p
179. national meeting of the American Chemical Society, Houston, TX, USA, 23 Mar 1980.
Languages: English Document Type: Conference proceeding
NTIS Prices: PC A02/MF A01

215. 782608 STUDSVIK/E4-79/72
Description of an Experimental Model for Combustion in a Fast Fluidized Bed
Harju, R.
Studsvik Energiteknik AB, Nykoeping (Sweden).
Corp. Source Codes: 056472000; 6009900
Jul 79 35p
U.S. Sales Only.
Languages: English
NTIS Prices: PC A03/MF A01

216. 782528 SHG-IST-7
Drying and Storing Biomass: Needs and Methods
Mattsson, J. E.
Naemnden foer Energiproduktionsforskning, Stockholm (Sweden).
Corp. Source Codes: 057264000; 9698316
Report No.: NE-PROJ-1160271
1979 140p
In Swedish.
U.S. Sales Only.
Languages: Swedish
NTIS Prices: PC A07/MF A01

217. 778571 PB80-132769
Pollutants from Synthetic Fuels Production: Coal Gasification Screening Test Results
(Research rept.)
Cleland, J. G. ; Gangwal, S. K. ; Sparacino, C. M. ; Zweidinger, R. M. ; Nichols, D. G.
Research Triangle Inst., Research Triangle Park, NC.
Corp. Source Codes: 045968000
Sponsor: Industrial Environmental Research Lab., Research Triangle Park, NC.
Report No.: EPA-600/779-200
Aug 79 104p
Languages: English
NTIS Prices: PC A06/MF A01

218. 764880 STUDSVIK/E2-79/36
Material Problems at Combustion and Gasification of Biomass (Peat and Wood Products)
Tarkpea, P.
Studsvik Energiteknik AB, Nykoping (Sweden).
Corp. Source Codes: 6009900
Apr 79 42p
In Swedish.
U.S. Sales Only.
Languages: Swedish
NTIS Prices: PC A03/MF A01

219. 764879 STUDSVIK/E-4-79
Suitability of Different Gasification Processes for Energy Production in Sweden
Fornhammar, U. ; Maijgren, B. ; Kelen, T.
Studsvik Energiteknik AB, Nykoping (Sweden).
Corp. Source Codes: 6009900
31 Jan 79 76p
In Swedish.
U.S. Sales Only.
Languages: Swedish
NTIS Prices: PC A05/MF A01

220. 813333 DOE/ET/14696-T3
Peat Biogasification Development Program. Quarterly Progress Report No. 3, April 1-June 30, 1980
Wise, D. L.
Dynatech R/D Co., Cambridge, MA.
Corp. Source Codes: 030442000; 9500794
Sponsor: Department of Energy, Washington, DC.
1980 106p
Languages: English
NTIS Prices: PC A06/MF A01

221. 810730 FE-3125-21
Advanced Development of a Short-Residence-Time Hydrogasifier. Quarterly Technical Progress Report, April 1, 1980-June 30, 1980
Friedman, J.
Rockwell International, Canoga Park, CA. Environmental and Energy Systems Div.
Corp. Source Codes: 054566003; 9508754
Sponsor: Department of Energy, Washington, DC.
Jul 80 161p
Languages: English
NTIS Prices: PC A08/MF A01

222. 806744 CONF-800759-1
PEAT: An Energy Alternative
Schora, F. C. ; Punwani, D. V.
Institute of Gas Technology, Chicago, IL.
Corp. Source Codes: 013602000; 9500656
Sponsor: Department of Energy, Washington, DC.
1980 29p
Energy in the third world conference, Vienna, Austria, 28 Jul 1980.
Languages: English Document Type: Conference proceeding
NTIS Prices: PC A03/MF A01

223. 797087 FE-3125-18
Advanced Development of a Short-Residence-Time Hydrogasifier. Quarterly Technical Progress Report, January 1, 1980-March 31, 1980
Atomics International Div., Canoga Park, CA. Energy Systems Group.
Corp. Source Codes: 9509479
Sponsor: Department of Energy, Washington, DC.
Apr 80 152p
Languages: English
NTIS Prices: PC A08/MF A01

224. 796950 EPRI-AF-1298(V.2)
Nature and Origin of Asphaltenes in Processsed Coals. Volume 2. The Chemistry and Mechanisms of Coal Conversion to Clean Fuel. Final Report, March 1977-January 1979
Whitehurst, D. D. ; Mitchell, T. O. ; Farcasiu, M. ; Dickert, Jr, J. J.
Mobil Research and Development Corp., Princeton, NJ. Central Research Div.
Corp. Source Codes: 9504055
Dec 79 524p
Languages: English
NTIS Prices: PC A22/MF A01

225. 796650 DOE/ET/12328-T1
Coal Combustion by Wet Oxidation. Wet Oxidation of Coal for Energy Production: Test Plan and Partial Results. Interim Report
Bettinger, J. A.
Michigan Technological Univ., Houghton.
Corp. Source Codes: 4128000
Sponsor: Department of Energy, Washington, DC.
10 Jul 80 58p
Languages: English
NTIS Prices: PC A04/MF A01

226. 792999 FE-2469-49
Experimental Program for the Development of Peat Gasification. Process Designs and Cost Estimates for the Manufacture of 250 Billion Btu/Day SNG from Peat by the PEATGAS Process. Interim Report No. 8
Arora, J. L. ; Tsaros, C. L.
Institute of Gas Technology, Chicago, IL.
Corp. Source Codes: 013602000; 9500656
Sponsor: Department of Energy, Washington, DC.
Feb 80 52p
Languages: English
NTIS Prices: PC A04/MF A01

227. 841312 COO-2981-61
Indirect Thermal Liquefaction Process for Producing Liquid Fuels from Biomass
Kuester, J. L.
Arizona State Univ., Tempe. Dept. of Chemical Engineering.
Corp. Source Codes: 000950035; 9506079
Sponsor: Department of Energy, Washington, DC.
Report No.: CONF-800802-24
1980 24p
89. annual meeting of the American Institute of Chemical Engineers, Portland, OR, USA, 17 Aug 1980.
Languages: English Document Type: Conference proceeding
NTIS Prices: PC A02/MF A01

228. 839019 NE/TORV-80
Vyrmethane. Final Report
Studsvik Energiteknik AB, Nykoeping (Sweden).
Corp. Source Codes: 056472000; 6009900
Jan 80 46p
In Swedish.
U.S. Sales Only.
Languages: Swedish
NTIS Prices: PC A03/MF A01

229. 833420 NE-1980-2
Future Fuel Market in Sweden
Ljung, H. ; Ryytty, C.
Naemnden foer Energiproduktionsforskning, Stockholm (Sweden).
Corp. Source Codes: 057264000; 9698316
1980 200p
In Swedish.
U.S. Sales Only.
Languages: Swedish
NTIS Prices: PC A09/MF A01

230. 833054 DOE/ET/12328-T2
Coal Combustion by Wet Oxidation
Bettinger, J. A. ; Lamparter, R. A. ; McDowell, D. C.
Michigan Technological Univ., Houghton. Center for Waste Management Programs.
Corp. Source Codes: 011343009; 9509463
Sponsor: Department of Energy, Washington, DC.
15 Nov 80 203p
Languages: English
NTIS Prices: PC A10/MF A01

231. 831165 FE-3125-24(V.2)
Coal Hydrogasification Process Development. Volume II. Peat Studies. Second Annual Technical Progress Report, Government Fiscal Year 1980
Sprouse, K. M. ; Rosemary, J. K.
Atomics International Div., Canoga Park, CA. Energy Systems Group.
Corp. Source Codes: 053034002; 9509479
Sponsor: Department of Energy, Washington, DC.
20 Oct 80 151p
Languages: English
NTIS Prices: PC A08/MF A01

232. 821184 DOE/ET/14696-T4
Peat Biogasification Development Program. Quarterly Progress Report No. 4, July 1-September 30, 1980
Dynatech Corp., Cambridge, MA.
Corp. Source Codes: 010190000; 2241000
Sponsor: Department of Energy, Washington, DC.
15 Oct 80 24p
Languages: English
NTIS Prices: PC A02/MF A01

233. 820959 CONF-800997-1
Overview of Metal Properties Council Materials Studies in Gasification Pilot Plants
Arnold, J. M.
Institute of Gas Technology, Chicago, IL.
Corp. Source Codes: 013602000; 9500656
Sponsor: Department of Energy, Washington, DC.
1980 26p
Conference on the properties and performance of materials in the coal gasification environment, Pittsburgh, PA, USA, 8 Sep 1980.
Languages: English Document Type: Conference proceeding
NTIS Prices: PC A03/MF A01

234. 820949 CONF-800876-2
Synthetic Fuels from Peat by the IGT PEATGAS Process
Punwani, D. V. ; Rader, A. M. ; Kopstein, M. J.
Institute of Gas Technology, Chicago, IL.
Corp. Source Codes: 013602000; 9500656
Sponsor: Minnesota Gas Co., Minneapolis.; Department of Energy, Washington, DC.
1980 29p
International peat congress, Duluth, MN, USA, 17 Aug 1980.
Languages: English Document Type: Conference proceeding
NTIS Prices: PC A03/MF A01

235. 858420 DOE/FC/10066-T1(V.6)
Low-Rank Coal Study: National Needs for Resource Development. Volume 6. Peat
Energy Resources Co., Inc., Walnut Creek, CA.
Corp. Source Codes: 073869000; 9513317
Sponsor: Department of Energy, Washington, DC.
Nov 80 36p
Languages: English
NTIS Prices: PC A03/MF A01

236. 858419 DOE/FC/10066-T1(V.5)
Low-Rank Coal Study. Volume 5. RD And D Program Evaluation
Energy Resources Co., Inc., Walnut Creek, CA.
Corp. Source Codes: 073869000; 9513317
Sponsor: Department of Energy, Washington, DC.
Nov 80 133p
Languages: English
NTIS Prices: PC A07/MF A01

237. 858418 DOE/FC/10066-T1(V.4)
Low-Rank Coal Study. Volume 4. Regulatory, Environmental, and Market Analyses
Energy Resources Co., Inc., Walnut Creek, CA.
Corp. Source Codes: 073869000; 9513317
Sponsor: Department of Energy, Washington, DC.
Nov 80 241p
Languages: English
NTIS Prices: PC A11/MF A01

238. 852904 DOE/ET/10283-T3
Experimental Program for the Development of Peat Gasification. Monthly Status Report, February 1-February 28, 1981
Institute of Gas Technology, Chicago, IL.
Corp. Source Codes: 013602000; 9500656
Sponsor: Department of Energy, Washington, DC.
Report No.: FE-2469-69
Mar 81 13p
Languages: English
NTIS Prices: PC A02/MF A01

239. 850247 DOE/ET/10159-T6
Peat Prospectus
UOP, Inc., San Diego, CA.
Corp. Source Codes: 055726000; 9505101
Sponsor: SDC Integrated Services, Inc., San Diego, CA.; Department of Energy, Washington, DC.
Jul 79 86p
Languages: English
NTIS Prices: PC A05/MF A01

240. 849169 TR-80/031-001
Proceedings of the US Department of Energy's First Technical Contractors' Conference on Peat
System Development Corp., McLean, VA.
Corp. Source Codes: 100923000; 9502772
Sponsor: UOP, Inc., McLean, VA.; Department of Energy, Washington, DC.
Report No.: CONF-8003134-
1980 374p
Technical contractors' conference on peat, Rockville, MD, USA, 11 Mar 1980.
Languages: English Document Type: Conference proceeding
NTIS Prices: PC A16/MF A01

241. 841799 GFETC/IC-80
Low-Rank Coal Publications Contributed by Grand Forks Energy Technology Center, United States Department of Energy, 1939-1979
Boley, C. C.
Department of Energy, Grand Forks, ND. Grand Forks Energy Technology Center.
Corp. Source Codes: 066742002; 9509778
Sponsor: Department of Energy, Washington, DC.
1980 47p
Languages: English Document Type: Bibliography
NTIS Prices: PC A03/MF A01

242. 841798 GFETC/IC-79
Technology and Use of Lignite
Kube, W. R. ; Gronhovd, G. H.
Department of Energy, Grand Forks, ND. Grand Forks Energy Technology Center.
Corp. Source Codes: 066742002; 9509778
Sponsor: Department of Energy, Washington, DC.
Report No.: CONF-790579-
1979 542p
10. biennial lignite symposium, Grand Forks, ND, USA, 30 May 1979.
Languages: English Document Type: Conference proceeding
NTIS Prices: PC A23/MF A01

243. 878991 DE81028299
Peat Biogasification Development Program
Minnesota Gas Co., Minneapolis.
Corp. Source Codes: 074290000; 9508279
Sponsor: Department of Energy, Washington, DC.
Report No.: DOE-ET
21 Apr 81 240p
Languages: English
NTIS Prices: PC A11/MF A01

244. 875339 PB82-118498
Combustion of Low Grade Coal
Morrison, G. F.
International Energy Agency Coal Research, London (England).
Corp. Source Codes: 073269000
Report No.: ICTIS; ISBN-92-9029-016-1
c1978 93p
Previously announced as N80-11179.
Customers in countries other than the U.S. should apply to: Technical Information Service, IEA Coal Research, 14/15 Lower Grosvenor Place, London SW1W OEX, England. Also available in set of 16 reports paper copy or microfiche $281.50, PB82-125030.
Languages: English
NTIS Prices: PC$18.00/MF$18.00

245. 869333 PB81-238651
Power Plant Ashes and Their Utilization. Part 10. Summary (Voimalaitostuhkat ja Niiden Hyvaeksikaeyttoe. Osa 10. Yhteenveto)
Eerola, Martti ; Keppo, Martti ; Korkman, Johan ; Kukko, Heikki ; Vanhanen, Ari
Valtion Teknillinen Tutkimuskeskus, Espoo (Finland). Betoni- ja Silikaattitekniikan Lab.
Corp. Source Codes: 067526006
Report No.: TIEDONANTO-68; ISBN-951-38-1135-2
1980 94p
Text in Finnish, abstract in English. Also pub. as ISSN-0357-3737.
Languages: Finnish
NTIS Prices: PC A05/MF A01

246. 863634 DOE/ET/21067-T1
Report on Alternate Fuels Manufactured from High Temperature Solar Thermal Systems
New Hampshire Univ., Durham. Dept. of Chemical Engineering.
Corp. Source Codes: 012609026; 9502789
Sponsor: Department of Energy, Washington, DC.
May 80 74p
Languages: English
NTIS Prices: PC A04/MF A01

247. 861816 PB81-226482
Energy Production from Straw (Energiegewinnung aus Stroh)
(Final rept.)
Strehler, A.
Commission of the European Communities, Luxembourg.
Corp. Source Codes: 048489000
Report No.: EUR-6955-EN-FR
c1980 80p
Text in German. Prepared in cooperation wih Bayerische Landesanstalt fuer Landtechnik, Munich (Germany, F.R.).
Customers in the European Community Countries should apply to the office for official publications of the European Communities, B.P. 1003, Luxembourg.
Languages: German
NTIS Prices: PC E04/MF E04

248. 860820 DE81025019
Continuous Two-Stage Solar-Gasification System
Mathur, V. K. ; Lakshmanan, S. ; Manasse, F. K. ; Venkataramanan, V. ; Breault, R. W.
New Hampshire Univ., Durham. Dept. of Chemical Engineering.
Corp. Source Codes: 012609026; 9502789
Sponsor: Department of Energy, Washington, DC.
Report No.: CONF-801104-16
1980 20p
73. annual meeting of the American Institute of Chemical Engineers, Chicago, IL, USA, 12 Nov 1980.
Languages: English Document Type: Conference proceeding
NTIS Prices: PC A02/MF A01

249. 859387 PB81-222275
Feedstock Characteristics and Preparation for Peat Gasification
(Final rept. for Phase I, 1 Apr-30 Jun 80)
Punwani, D. V. ; Aspinall, F. ; Lofton, S. M.
Institute of Gas Technology, Chicago, IL.
Corp. Source Codes: 013602000
Sponsor: Gas Research Inst., Chicago, IL.
Report No.: GRI79/0092
Mar 81 333p
Prepared in cooperation with Dravo Engineers and Constructors, Pittsburgh, PA., and Williams Brothers Engineering Co., Tulsa, OK.
Languages: English
NTIS Prices: PC A15/MF A01

250. 903930 DE82003634
Potential for Use of Peat Blends with Coal for Electric Power Generation. Final Technical Report, April 1981
Anson, D. ; Murin, J. ; Hazard, H. R.
Battelle Columbus Labs., OH.
Corp. Source Codes: 038006000; 9500081
Sponsor: Department of Energy, Washington, DC.
Report No.: DOE-FC
1981 115p
Languages: English
NTIS Prices: PC A06/MF A01

251. 903820 DE82001067
Comparative Analysis of Peat Gasification Reactor Configuration. Final Report
UOP, Inc., McLean, VA.
Corp. Source Codes: 072078000; 9511742
Sponsor: System Development Corp., McLean, VA.; Department of Energy, Washington, DC.
Report No.: DOE-ET
Jul 81 94p
Languages: English
NTIS Prices: PC A05/MF A01

252. 898856 DOE/FC/10169-T1
Environmental Aspects of Alternative Wet Technologies for Producing Energy/Fuel from Peat. Final Report
Smith, R. T.
Energy Resources Co., Inc., Walnut Creek, CA.
Corp. Source Codes: 073869000; 9513317
Sponsor: Department of Energy, Washington, DC.
1 May 81 142p
Languages: English
NTIS Prices: PC A07/MF A01

253. 882292 FE-3125-15
Advanced Development of a Short-Residence time Hydrogasifier. Quarterly Technical Progress Report, October 1, 1979-December 31, 1979
Friedman, J.
Atomics International Div., Canoga Park, CA. Energy Systems Group.
Corp. Source Codes: 053034002; 9509479
Sponsor: Department of Energy, Washington, DC.
Jan 80 95p
Languages: English
NTIS Prices: PC A05/MF A01

254. 882281 FE-2518-24
Development of a Single-Stage, Entrained-Flow, Short-Residence-Time Hydrogasifier. Final Report
Rockwell International, Canoga Park, CA. Environmental and Energy Systems Div.
Corp. Source Codes: 054566003; 9508754
Sponsor: Department of Energy, Washington, DC.
Jul 79 503p
Languages: English
NTIS Prices: PC A22/MF A01

255. 881975 DE82000873
Development of Peatlands in Northern Minnesota. Technical Progress Report
Wright, Jr, H. E.
Minnesota Univ., Minneapolis. Limnological Research Center.
Corp. Source Codes: 012002057; 9514037
Sponsor: Department of Energy, Washington, DC.
Report No.: DOE-EV
Sep 81 5p
Languages: English
NTIS Prices: PC A02/MF A01

256. 879810 N81-33668
Simultaneous Thermal Analysis of Solid Fuels
Ranta, J. ; Nyroenen, T.
Valtion Teknillinen Tutkimuskeskus, Espoo (Finland). Poltto- ja Voiteluainelaboratorio.
Corp. Source Codes: 067526005; TD275061
Sponsor: National Aeronautics and Space Administration, Washington, DC.
Report No.: VTT-34; ISBN-951-38-1125-2
Jul 80 87p
In Finnish; English Summary.
Languages: Finnish
NTIS Prices: PC A05/MF A01

257. 879505 DE81030954
Development of Hydroconversion of Biomass to Synthetic Fuels. Project 61042 Technical Progress Report, January 1-March 31, 1981
Institute of Gas Technology, Chicago, IL.
Corp. Source Codes: 013602000; 9500656
Sponsor: Department of Energy, Washington, DC.
Report No.: DOE-CS
Jul 81 56p
Languages: English
NTIS Prices: PC A04/MF A01

258. 926872 DE82005201
Overview - Using Peat for Energy: Potential Environmental Constraints
Reed, R. M. ; Voorhees, L. D. ; Mulholland, P. J.
Oak Ridge National Lab., TN.
Corp. Source Codes: 021310000; 4832000
Sponsor: Department of Energy, Washington, DC.
Report No.: CONF-811217-1
1981 37p
Conference on peat as an alternative, Arlington, VA, USA, 1 Dec 1981.
Languages: English Document Type: Conference proceeding
NTIS Prices: PC A03/MF A01

259. 921013 DE82900797
Firing of Domestic Solid Fuels
Naemnden foer Energiproduktionsforskning, Stockholm (Sweden).
Corp. Source Codes: 057264000; 9698922
Report No.: NE-1981-3
Jan 81 186p
In Swedish.
U.S. Sales Only.
Languages: Swedish
NTIS Prices: PC A09/MF A01

260. 921002 DE82900677
Biofuels for Heating: In Municipal Energy Planning
Hardell, R. ; Liljequist, U. ; Schuster, R. ; Wester, L.
Swedish Council for Building Research, Stockholm.
Corp. Source Codes: 060307000; 9698482
Report No.: SIB-R-102-1980
1980 204p
In Swedish.
U.S. Sales Only.
Languages: Swedish
NTIS Prices: PC A10/MF A01

261. 917032 DE82008424
Hydrogen or Carbon Monoxide in the Liquefaction of Biomass
Davis, H. ; Figueroa, C. ; Schaleger, L.
California Univ., Berkeley. Lawrence Berkeley Lab.
Corp. Source Codes: 005029222; 9513034
Sponsor: Department of Energy, Washington, DC.
Report No.: LBL-14018
Feb 82 18p
Languages: English
NTIS Prices: PC A02/MF A01

262. **Simultaneous Thermal Analysis of Solid Fuels**
Ranta, J. ; Nyroenen, T.
Valtion Teknillinen Tutkimuskeskus, Espoo (Finland).
Corp. Source Codes: 067526000; TD239784
Sponsor: National Aeronautics and Space Administration, Washington, DC.
Report No.: DE82-901184; VTT-POV-34
Dec 80 86p
In Finnish; English Summary.
Languages: Finnish
NTIS Prices: PC A05/MF A01

263. 909417 DE82901194
Power Plant Ashes and Their Utilization. Part 10. Summary
Eerola, M. ; Keppo, M. ; Korkman, J. ; Kukko, H. ; Vanhanen, A.
Valtion Teknillinen Tutkimuskeskus, Espoo (Finland). Betoni- ja Silikaattitekniikan Lab.
Corp. Source Codes: 067526006; 9830400
Report No.: VTT-BET-68
Dec 80 94p
In Finnish.
U.S. Sales Only.
Languages: Finnish
NTIS Prices: PC A05/MF A01

264. 909411 DE82901140
Power Plant Ashes and Their Utilization. Part 1. The Quantities of Ashes Produced in Finland and Their Quality
Keppo, M. ; Ylinen, P.
Valtion Teknillinen Tutkimuskeskus, Espoo (Finland). Betoni- ja Silikaattitekniikan Lab.
Corp. Source Codes: 067526006; 9830400
Report No.: VTT-BET-61
Jun 80 141p
In Finnish.
U.S. Sales Only. Available in microfiche only.
Languages: Finnish
NTIS Prices: MF A01

265. 941052 DE82015260
Testimony on Coal Research Needs to the House Subcommittee on Energy Development and Applications
Traeger, R. K.
Sandia National Labs., Albuquerque, NM.
Corp. Source Codes: 068123000; 9511100
Sponsor: Department of Energy, Washington, DC.
Report No.: SAND-82-1231C
1982 10p
Available in microfiche only.
Languages: English
NTIS Prices: MF A01

266. 938271 DE82012706
Status of the PEATGAS Pilot Plant Development Program
Biljetina, R. ; Punwani, D. V.
Institute of Gas Technology, Chicago, IL.
Corp. Source Codes: 013602000; 9500656
Sponsor: Department of Energy, Washington, DC.
Report No.: CONF-811217-2
1981 25p
Conference on peat as an alternative, Arlington, VA, USA, 1 Dec 1981.
Best available copy from document source. Available in microfiche only.
Languages: English Document Type: Conference proceeding
NTIS Prices: MF A01

267. 936452 N82-29491
Biofuels for Heating: In Municipal Energy Planning
Hardell, R. ; Liljequist, U. ; Schuster, R. ; Wester, L.
Swedish Council for Building Research, Stockholm.
Corp. Source Codes: 060307000; S1366317
Sponsor: National Aeronautics and Space Administration, Washington, DC.
Report No.: DE82-900677; SIB-R-102-1980
1980 204p
Text in Swedish.
Languages: Swedish
NTIS Prices: PC A10/MF A01

268. 933783 DE82010911
Experimental Program for the Development of Peat Gasification: Interim Report No. 10. Low-Severity Hydropyrolysis
Minnesota Gas Co., Minneapolis.
Corp. Source Codes: 074290000; 9508279
Sponsor: Department of Energy, Washington, DC.
Report No.: DOE-ET; FE-2469-62
Feb 82 44p
Portions of document are illegible.
Microfiche only after original copies are exhausted.
Languages: English
NTIS Prices: PC A03/MF A01

269. 929938 DE82901184
Simultaneous Thermal Analysis of Solid Fuels
Ranta, J. ; Nyroenen, T.
Valtion Teknillinen Tutkimuskeskus, Espoo (Finland). Poltto- ja Voiteluainelaboratorio.
Corp. Source Codes: 067526005; 9830700
Report No.: VTT-POV-34
Dec 80 86p
In Finnish.
U.S. Sales Only.
Languages: Finnish
NTIS Prices: PC A05/MF A01

270. 929913 DE82900925
Use of Methanol as a Fuel in Finland. Technical and Economic Aspects
Solantausta, Y. ; Asplund, D.
Valtion Teknillinen Tutkimuskeskus, Espoo (Finland). Poltto- ja Voiteluainelaboratorio.
Corp. Source Codes: 067526005; 9830700
Report No.: VTT-POV-32
Sep 80 101p
In Finnish.
U.S. Sales Only. Available in microfiche only.
Languages: Finnish
NTIS Prices: MF A01

271. 929912 DE82900924
Classification and Properties of Peat for Fuel Purposes
Berggren, B. ; Kalmari, A. ; Leino, P.
Finnish Energy Economy Association, Helsinki.
Corp. Source Codes: 075511000; 9820300
Report No.: EKONO-158
1980 30p
Contains also the Finnish Fuel Peat Standard 1976 by Finnish Peat Society.
U.S. Sales Only.
Languages: English
NTIS Prices: PC A03/MF A01

272. 951257 PB83-136242
Feedstock Characteristics and Preparation for Peat Gasification. Volume I: Tasks 8, 10, 11, and 12
(Final rept. Jul 80-Jul 81)
Punwani, D. V. ; Aspinall, F. ; Lofton, S. M.
Institute of Gas Technology, Chicago, IL.
Corp. Source Codes: 013602000
Sponsor: Gas Research Inst., Chicago, IL.
Report No.: GRI81/0011.1
Jul 82 164p
See also PB81-222275, and Volume 2, PB83-136259. Prepared in cooperation with Dravo Corp., Pittsburgh, PA., and Williams Bros. Engineering Co., Tulsa, OK.
Also available in set of 3 reports PC E99, PB83-136234.
Languages: English
NTIS Prices: PC A08/MF A01

273. 951256 PB83-136234
Feedstock Characteristics and Preparation for Peat Gasification
Institute of Gas Technology, Chicago, IL.
Corp. Source Codes: 013602000
Sponsor: Gas Research Inst., Chicago, IL.
Jul 82 671p-in 3v
Set includes PB83-136242 thru PB83-136267.
Languages: English
NTIS Prices: PC E99

274. 950383 DE82901530
Use of Domestic Fuels for Large-Scale Space Heating and for District Heating
Seppaelae, R. ; Asplund, D.
Valtion Teknillinen Tutkimuskeskus, Espoo (Finland). Poltto- ja Voiteluainelaboratorio.
Corp. Source Codes: 067526005; 9830700
Report No.: VTT-POV-35
Dec 80 201p
In Finnish. Portions of document are illegible.
U.S. Sales Only.
Languages: Finnish
NTIS Prices: PC A10/MF A01

275. 950342 DE82900780
Engine for Biomass Fuel Functioning by the Brayton-Process and Isothermal Compression
Arkedal, G.
Styrelsen foer Teknisk Utveckling, Stockholm (Sweden).
Corp. Source Codes: 065128000; 6011800
Report No.: STU-80-3853
Nov 80 64p
In Swedish. Portions of document are illegible.
U.S. Sales Only.
Languages: Swedish
NTIS Prices: PC A04/MF A01

276. 948023 DE82901148
Gasification of Milled Peat in Fluidized Bed. Preliminary Study
Salo, K. ; Filen, H. ; Asplund, D.
Valtion Teknillinen Tutkimuskeskus, Espoo (Finland). Poltto- ja Voiteluainelaboratorio.
Corp. Source Codes: 067526005; 9830700
Report No.: VTT-POV-28
Jan 80 66p
In Finnish.
U.S. Sales Only.
Languages: Finnish
NTIS Prices: PC A04/MF A01

277. 947625 DE82018558
Experimental Program for the Development of Peat Gasification. Interim Report No. 11. Solvent-Extraction Dewatering
Minnesota Gas Co., Minneapolis.
Corp. Source Codes: 074290000; 9508279
Sponsor: Institute of Gas Technology, Chicago, IL.; Department of Energy, Washington, DC.
Report No.: DOE-ET; FE-2469-63
Jul 82 36p
Portions of document are illegible.
Best available copy from document source. Available in microfiche only.
Languages: English
NTIS Prices: MF A01

278. 941152 DE82900767
Peat. Results, State of the Art, and Potentials. Progress Report from the NE Peat Program
Naemnden foer Energiproduktionsforskning, Stockholm (Sweden).
Corp. Source Codes: 057264000; 9698922
Report No.: NE-1981-5
Mar 81 127p
In Swedish. Portions of document are illegible.
U.S. Sales Only. Best available copy from document source. Available in microfiche only.
Languages: Swedish
NTIS Prices: MF A01

279. 958011 DE82902459
Utilization of Peat as a Fuel
Clemens, D. F. ; Evans, II, G. O. ; Whitehurst, B. M.
East Carolina Univ., Greenville, NC. Dept. of Chemistry.
Corp. Source Codes: 010232007; 9515088
Sponsor: Texasgulf, Inc., Aurora, NC.
Report No.: NCEI-0039
Oct 81 43p
Portions of document are illegible.
Languages: English
NTIS Prices: PC A03/MF A01

280. 957384 DE82022345
Peat Gasification Pilot Plant Program. Project 70105 Quarterly Report No. 3, December 1, 1981-February 28, 1982
Institute of Gas Technology, Chicago, IL.
Corp. Source Codes: 013602000; 9500656
Sponsor: Department of Energy, Washington, DC.
Report No.: DOE-ET
Sep 82 22p
Languages: English
NTIS Prices: PC A02/MF A01

281. 957317 DE82022204
Peat Gasification Pilot Plant Program. Project 70105 Quarterly Report No. 2, September 1-November 30, 1981
Institute of Gas Technology, Chicago, IL.
Corp. Source Codes: 013602000; 9500656
Sponsor: Department of Energy, Washington, DC.
Report No.: DOE-ET
Sep 82 49p
Portions of document are illegible.
Languages: English
NTIS Prices: PC A03/MF A01

282. 953077 DE82900946
Techniques for Solid Fuels in Large Plants - AN Economical Appraisement Aiming at the Necessity R and D
Holme, G.
Aaf, Energikonsult, Stockholm (Sweden).
Corp. Source Codes: 076642000; 9698972
Report No.: NE-TO-80
Mar 80 130p
In Swedish. Portions of document are illegible.
U.S. Sales Only.
Languages: Swedish
NTIS Prices: PC A07/MF A01

953076 DE82900944

283. **Burning Wood Chips in Swedish Municipalities: An Example of Energy Policy Surprises**
Stroh, U.
Corp. Source Codes: 9999999
Report No.: LUTMDN
Jun 80 43p
In Swedish. Portions of document are illegible.
U.S. Sales Only.
Languages: Swedish
NTIS Prices: PC A03/MF A01

284. 951259 PB83-136267
Feedstock Characteristics and Preparation for Peat Gasification. Volume III: Task 13
(Final rept. Jul 80-Jul 81)
Punwani, D. V. ; Aspinall, F. ; Lofton, S. M.
Institute of Gas Technology, Chicago, IL.
Corp. Source Codes: 013602000
Sponsor: Gas Research Inst., Chicago, IL.
Report No.: GRI81/0011.3
Jul 82 257p
See also Volume 2, PB83-136259. Prepared in cooperation with Dravo Corp., Pittsburgh, PA., and Williams Bros. Engineering Co., Tulsa, OK.
Also available in set of 3 reports PC E99, PB83-136234.
Languages: English
NTIS Prices: PC A12/MF A01

285. 951258 PB83-136259
Feedstock Characteristics and Preparation for Peat Gasification. Volume II: Task 9
(Final rept. Jul 80-Jul 81)
Punwani, D. V. ; Aspinall, F. ; Lofton, S. M.
Institute of Gas Technology, Chicago, IL.
Corp. Source Codes: 013602000
Sponsor: Gas Research Inst., Chicago, IL.
Report No.: GRI81/0011.2
Jul 82 250p
See also PB81-222275, Volume 1, PB83-136242, and Volume 3, PB83-136267. Prepared in cooperation with Dravo Corp., Pittsburgh, PA., and Williams Bros. Engineering CO., Tulsa, OK.
Also available in set of 3 reports PC E99, PB83-136234.
Languages: English
NTIS Prices: PC A11/MF A01

11/3/1
99040991 CA: 99(6)40991z PATENT
286. Gas generators
INVENTOR(AUTHOR): Evrard, Willy
LOCATION: Belg.
PATENT: European Pat. Appl. ; EP 78068 A2 DATE: 830504
APPLICATION: EP 82201046 (820820); *BE 475 (810825)
PAGES: 17 pp. CODEN: EPXXDW LANGUAGE: French CLASS: C10J-003/26, C10J-003/84 DESIGNATED COUNTRIES: AT; DE; FR; IT; NL

11/3/2
99040895 CA: 99(6)40895w CONFERENCE PROCEEDING
287. Pyrolysis of peat in a low-temperature plasma
AUTHOR: Dvindenko, I. A.; Zhukov, V. K.; Ermolaeva, E. M.; Mazina, O. I.
LOCATION: USSR
JOURNAL: Protsessy Nizkotemp. Plazme Plazmennye Appar. EDITOR: Yas'ko, O. I (Ed) DATE: 1983 PAGES: 57-66 CODEN: 49UUA5 LANGUAGE: Russian PUBLISHER: Akad. Nauk BSSR, Inst. Teplo Massoobmena, Minsk, USSR

11/3/3
99027088 CA: 99(4)27088r JOURNAL
288. Study of ash from Tyumen peat entrainment as a base for production of binders
AUTHOR: Savinkina, M. A.; Isakova, O. Ya.; Logvinenko, A. T.; Kokaulina, E. V.
LOCATION: Inst. Fiz.-Khim. Osn. Pererab. Miner. Syr'ya, Novosibirsk, USSR
JOURNAL: Izv. Vyssh. Uchebn. Zaved., Stroit. Arkhit. DATE: 1983 NUMBER: 2 PAGES: 69-72 CODEN: IVZSA8 ISSN: 0536-1052 LANGUAGE: Russian

11/3/4
99008236 CA: 99(2)8236w TECHNICAL REPORT
289. Swedish gasification research and process development at RIT
AUTHOR: Blomkvist, Goeran; Liinanki, Leif; Lindman, Nils; Sjoeberg, S. O.
LOCATION: Dep. Chem. Technol., R. Inst. Technol., S-100 44, Stockholm, Swed.
JOURNAL: Comm. Eur. Communities, (Rep.) EUR DATE: 1983 NUMBER: EUR 8245, Energy Biomass PAGES: 896-900 CODEN: CECED9 LANGUAGE: English

11/3/5
99008205 CA: 99(2)8205k PATENT
290. Synthetic liquid and gaseous hydrocarbon fuels from peat
INVENTOR(AUTHOR): Punwani, Dharamvir; Weil, Sandford A.; Bodle, William W.
LOCATION: USA
ASSIGNEE: Institute of Gas Technology
PATENT: Britain UK Pat. Appl. ; GB 2106128 A1 DATE: 830407
APPLICATION: GB 8122232 (810718)
PAGES: 9 pp. CODEN: BAXXDU LANGUAGE: English CLASS: C10G-001/06, C10F-005/06, C10J-003/00

11/3/6
98201120 CA: 98(24)201120m JOURNAL
291. Transformation of the mineral part of peat during combustion and their effect on properties of light ash
AUTHOR: Savinkina, M. A.; Sharlovskaya, M. S.; Kokaulina, E. V.; Kondysin, Yu. A.; Isakova, O. Ya.; Logvinenko, A. T.; Belov, S. Yu.
LOCATION: USSR
JOURNAL: Khim. Tverd. Topl. (Moscow) DATE: 1983 NUMBER: 2 PAGES: 130-7 CODEN: KTVTBY ISSN: 0023-1177 LANGUAGE: Russian

11/3/7
98201051 CA: 98(24)201051a JOURNAL
292. Operating experience of commercial scale Pyroflow circulating fluidized-bed combustion boilers
AUTHOR: Engstrom, Folke
LOCATION: A. Ahlstrom Co., Karhula, Finland
JOURNAL: Proc. Int. Conf. Fluid. Bed Combust. DATE: 1983 VOLUME: 7th NUMBER: 2 PAGES: 1136-43 CODEN: PCFCDB ISSN: 0197-453X
LANGUAGE: English MEETING DATE: 820000

11/3/8
98200038 CA: 98(24)200038d TECHNICAL REPORT
293. Catalytic liquefaction of wood material
AUTHOR: Burton, A.; De Zutter, D.; Grange, P.; Poncelet, G.; Delmon, B.
LOCATION: Groupe Phys.-Chim. Miner. Catal., Univ. Cathol. Louvain, B-1348, Louvain-la-Neuve, Belg.
JOURNAL: Comm. Eur. Communities, (Rep.) EUR DATE: 1983 NUMBER: EUR 8245, Energy Biomass PAGES: 935-9 CODEN: CECED9 LANGUAGE: English

11/3/9
98182390 CA: 98(22)182390f JOURNAL
294. Oxygen removal during the direct liquefaction of low-rank materials. Stoichiometric considerations
AUTHOR: McKeough, Paterson J.
LOCATION: Fuel Lubr. Res. Lab., Tech. Res. Cent. Finland, 02150, Espoo, Finland
JOURNAL: Fuel DATE: 1983 VOLUME: 62 NUMBER: 4 PAGES: 445-9
CODEN: FUELAC ISSN: 0016-2361 LANGUAGE: English

11/3/10
98182370 CA: 98(22)182370z JOURNAL
295. The influence of potassium carbonate on surface area development and reactivity during gasification of activated carbon by carbon dioxide
AUTHOR: Wigmans, Teus; Hoogland, Anton; Tromp, Peter; Moulijn, Jacob A.
LOCATION: Inst. Chem. Technol., 1018 TV, Amsterdam, Neth.
JOURNAL: Carbon DATE: 1983 VOLUME: 21 NUMBER: 1 PAGES: 13-22
CODEN: CRBNAH ISSN: 0008-6223 LANGUAGE: English

11/3/11
98182302 CA: 98(22)182302d JOURNAL
296. Startup and operating experience at the Kauttua 22-MWe cogeneration circulating fluidized-bed combustion plant
AUTHOR: Oakes, Eric J.; Javen, Jorgen; Engstrom, Folke
LOCATION: Pyropower Corp., San Diego, CA, USA
JOURNAL: Proc. Am. Power Conf. DATE: 1982 VOLUME: 44, PAGES: 64-8
CODEN: PAPWA2 ISSN: 0097-2126 LANGUAGE: English

11/3/12
98166213 CA: 98(20)166213v TECHNICAL REPORT
297. Emissions from combustion of peat and wood-chips
AUTHOR: Rudling, L.; Loefroth, G.
LOCATION: Statens Naturvaardsverk, Solna, Swed.
JOURNAL: Report DATE: 1981 NUMBER: SNV-PM-1449; Order No. DE8275104
PAGES: 96 pp. CODEN: D3REP3 LANGUAGE: Swedish CITATION: Energy Res. Abstr. 1983, 8(3), Abstr. No. 6059 AVAIL: NTIS (U.S. Sales Only)

11/3/13
98146283 CA: 98(18)146283a JOURNAL
298. Continued development of a peat biogasification process
AUTHOR: Wise, D. L.; Ashare, E.; Ruoff, C. F.; Korstein, M. J.
LOCATION: Dynatech R/D Co., Cambridge, MA, 02139, USA
JOURNAL: Resour. Conserv. DATE: 1983 VOLUME: 8 NUMBER: 3 PAGES [illegible] LANGUAGE: English

11/3/14
98110250 CA: 98(14)110250n CONFERENCE PROCEEDING
299. Some results of studies of the spontaneous combustion of peat by DTA --
AUTHOR: Falyushin, P. L.; Kashinskaya, T. Ya.
LOCATION: USSR
JOURNAL: Nov. Protsessy Prod. Pererab. Torfa EDITOR: Lishtvan, I. I (Ed)
DATE: 1982 PAGES: 26-30 CODEN: 49EPAC LANGUAGE: Russian
PUBLISHER: Nauka Tekh., Minsk, USSR

11/3/15
98110246 CA: 98(14)110246r TECHNICAL REPORT
300. Utilization of peat as a fuel
AUTHOR: Clemens, D. F.; Evans, G. O., II; Whitehurst, B. M.
LOCATION: Dep. Chem., East Carolina Univ., Greenville, NC, USA
JOURNAL: Report DATE: 1981 NUMBER: NCEI-0039; Order No. DE82902459
PAGES: 43 pp. CODEN: D3REP3 LANGUAGE: English CITATION: Energy
Res. Abstr. 1982, 7(18), Abstr. No. 45586 AVAIL: NTIS

11/3/16
98092451 CA: 98(12)92451x PATENT
301. Apparatus for solubilizing and oxidizing of peat
INVENTOR(AUTHOR): Elmore, Carl L.; Funk, Erwin D.; Poulin, Ted M.
LOCATION: USA
ASSIGNEE: Kamyr, Inc.
PATENT: United States ; US 4365974 A DATE: 821228
APPLICATION: US 182314 (800828)
PAGE* U % Maa 5 T TT glish P**

; C10J-003/00

11/3/17
98092217 CA: 98(12)92217a JOURNAL
302. Kinetics of the potassium carbonate-catalyzed carbon dioxide gasification of activated carbon
AUTHOR: Kapteijn, Freek; Moulijn, Jacob A.
LOCATION: Inst. Chem. Technol., Univ. Amsterdam, 1018 TV, Amsterdam, Neth.
JOURNAL: Fuel DATE: 19x W VOLUME: 62 NUMBER: 2 PAGES: 221-5
CODEN: FUELAC ISSN: 0016-2361 LANGUAGE: English

11/3/18
97095286 CA: 97(12)95286n CONFERENCE PROCEEDING
303. Peat dewatering: solvent extraction
AUTHOR: Punwani, Dharam V.
LOCATION: Inst. Gas Technol., 4xxX

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